APPENDIX D

CALCULATIONS

CALCULATION SHEET

Date: January 2019

CLIENT: NYC DDC PROJECT: Excavation and Capping of the Filled First Street Turning Basin, Gowanus Canal
Prepared By: Arcadis Reviewed By: AKRF Engineering, P.C./KS Engineers, P.C. Joint Venture
Project No.: B0018800.0000

SUBJECT: Estimated Material Removal Volume and Cap Construction Volume

1.0 INTRODUCTION

The remediation program for the First Street Turning Basin Site (Site) involves material removal from the filled basin, and restoration with a sediment cap. The vertical extent of material removal is such that the restored surface elevation will meet the adjacent remediated Remediation Target Area (RTA) 1 of the Gowanus Canal Superfund Site.

To plan for material removal logistics and duration, as well as material removal management operations, engineering estimates were performed to approximate the volume to be removed. Additionally, the volume estimated for the cap backfill is included within this calculation package.

2.0 REFERENCES

1. Survey of First Street Turning Basin Area conducted by B. Thayer Associates in October 2017.
2. United States Environmental Protection Agency (EPA). 2018. 1st Street Turning Basin Sediment Cap Treatment Layer Conceptual Design; Gowanus Canal Superfund Site, Brooklyn, New York. October 15.

3.0 METHODOLOGY AND ASSUMPTIONS

1. The existing surface of the Site was estimated from the spot elevations in the survey conducted by B. Thayer Associates in October 2017 (Reference 1). The existing surface slopes up from west to east.
    a. The average surface elevation on the west end was estimated to be approximately 10 feet (ft) North American Vertical Datum of 1988 (NAVD88).
    b. The average surface elevation on the east end was estimated to be approximately 16 ft NAVD88.
    c. The average surface elevation where the intertidal vegetative shelf gets narrower (moving west to east) was estimated to be approximately 14.5 ft NAVD88.
2. The RTA 1 dredge depth of -15 ft NAVD88 and RTA 1 final top of cap elevation of -12.50 ft NAVD88 were provided by the EPA (Reference 2). To accommodate coordination with the RTA 1 design, the excavation depth of the Site at the west end is approximately -16 ft NAVD88.
3. The excavation surface for the Site generally slopes up (from west to east) at a 1% slope from the mouth to the terminus of the basin.
4. The plan view areas were measured using AutoCAD.
5. Volumes presented within this calculation package are presented as cubic yards (cy). It is assumed that this is ‘in-place cy’, and the calculated removal volumes, do not account for shrinkage or swelling, which may occur during removal or placement.
6. The material removal volumes presented within this calculation package include soil, sediment, and debris volume.

7. Additional material removal necessary for installation of structural elements includes material displaced by installation of pipe piles and trenches for permanent bracing installation.
    a. The project includes:
        - 282 20-inch diameter pipe piles with an average length of 65 feet;
        - 234 24.5-inch diameter pipe piles with an average length of 82 feet; and
        - 151 34.5-inch diameter pipe piles with an average length of 87 feet.
    b. Transverse trenches are assumed to each be approximately 31.5 square feet (sf) in cross section and 28 feet long, and the total quantity included in the design is approximately 728 linear feet (lf).
    c. Longitudinal trenches are assumed to each be approximately 20 sf in cross-section, and the total length included in the design is 880 lf.
8. A 10% constructability factor was assumed for potential over-excavation (pile installation not included in this factor).
9. The Site cap layers of granular material are as illustrated in Construction Drawings (C-501), and include:
    a. Sand (6 inches);
    b. Oleophilic Clay (OC) and Sand (8 inches);
    c. Granulated Activated Carbon (GAC) and Sand (16 inches for Type 1, 29 inches for Type 2 and 3);
    d. Isolation and Filter (6 inches); and
    e. Gravel in Articulated Concrete Block (assumes 6 inches on average across 30% of area).
10. The Site intertidal vegetative shelf layers of granular material are as illustrated in Construction Drawings (C-501), and include:
    a. Gravel (12 inches);
    b. Sand (12 inches); and
    c. Sand Planting Soil (15.2 inches, minimum)
11. The sand planting soil surface of the intertidal vegetative shelf is tapered up from the minimum thickness at 10H:1V slope over the width of the shelf, with dimension calculated in AutoCAD.
12. Material loss for placement in the wet in the basin was assumed to be 15%, and material loss for placement in the semi-dry on the intertidal vegetative shelf was assumed to be 10%.

4.0 CALCULATIONS

4.1 Material Removal Volume in Basin and Intertidal Vegetative Shelf

Material removal volumes were calculated by hand, as shown on Attachment 1 for the basin and intertidal vegetative shelf areas. Each volume that contributes to the sum was calculated as follows:

$$V = (A * \frac{1}{2}(H_1 + H_2))/27$$

Where: V = volume (cy)
A = plan view area (sf; calculated in AutoCAD)
H = height of the left and right of the profile view of each section (ft)

4.2 Material Removal Volume for Installation of Structural Elements

Material removal volumes for pipe piles and trenches were calculated by hand, as shown on Attachment 1.

Volume associated with pipe piles was calculated as follows:

$$V = (\pi * r^2 * L)/27$$

Where: V = volume (cy)
r = radius (ft)
L = length (ft)

Volume associated with trenches was calculated as follows:

$$V = (A * L)/27$$

Where: V = volume (cy)
A = cross-sectional area (sf)
L = length (ft)

4.3 Cap Placement Volume (Granular Material) in the Basin

Cap placement volume in the basin was calculated based on the thicknesses provided in assumption 9, the area of the basin calculated in AutoCAD (see assumption 4), and the estimated material loss provided in assumption 12. For each layer:

$$V = (A * t * mlw)/27$$

Where: V = volume (cy)
A = plan view area (sf; calculated in AutoCAD)
t = thickness (ft)
mlw = material loss in the wet (115%)

For each layer the volumes are calculated as follows:

Layer	Volume (cy)
Sand	380
OC and Sand	510
GAC and Sand	1,650
Isolation and Filter	380
Gravel in ACB	110
Total	**3,000**

4.4 Cap Placement Volume (Granular Material) on the Intertidal Vegetative Shelf

Cap placement volume on the intertidal vegetative shelf was calculated based on the thicknesses provided in assumption 10, the area of the intertidal vegetative shelf calculated in AutoCAD (see assumption 4), and the estimated material loss provided in assumption 12.

For each layer:

$$V = (A * t * mld)/27$$

Where: V = volume (cy)
A = plan view area (sf; calculated in AutoCAD)
t = thickness (ft)
mld = material loss in the semi-dry (110%)

The additional Sand Planting Soil volume for the taper (see assumption 11) was calculated in a similar manner, but assuming a triangle instead of a rectangle for the area:

$$V = (A * \frac{1}{2} h * mld)/27$$

Where: V = volume (cy)
A = plan view area (sf; calculated in AutoCAD)
h = height of the tapered layer (ft)
mld = material loss in the semi-dry (110%)

For each layer the volumes are calculated as follows:

Layer	Volume (cy)
Gravel	340
Sand	340
Sand Planting Soil	430
Sand Planting Soil Wedge	320
Total	**1,400**

5.0 SUMMARY

A summary of the removal volumes and granular cap material volumes are below.

Total Removal Volume	**Volume (cy)**
Basin and Intertidal Vegetative Shelf	24,900
Structural Elements	8,400
Total	**33,300**

Total Cap Volume	**Volume (cy)**
Basin	3,000
Intertidal Vegetative Shelf	1,400
Total	**4,400**

1.0 INTRODUCTION

The remediation program for the First Street Turning Basin Site (Site) involves material removal from the filled basin, and restoration with a sediment cap. The vertical extent of material removal is such that saturated soils will be removed from the excavation below the high-high tide water level to elevation depths that allow for construction of a sediment cap. The sediment cap will meet the adjacent remediated Remediation Target Area (RTA) 1 of the Gowanus Canal Superfund Site.

To plan for the treatment of water generated from excavation, engineering estimates were performed to approximate the volume of excavation water generated based on low and high excavation production rates of 150 cubic yards per day (cy/day) to 500 cy/day. Calculations are summarized as follows.

2.0 REFERENCES

1. United States Environmental Protection Agency (EPA). 2018. 1st Street Turning Basin Sediment Cap Treatment Layer Conceptual Design; Gowanus Canal Superfund Site, Brooklyn, New York. October 15.

3.0 METHODOLOGY AND ASSUMPTIONS

1. The low and high excavation production rates are based on previous experience with similar excavation projects whereas the high, 500 cy/day, production rate may be associated with excavation of shallow saturated soils where less time is required to maneuver equipment and load and unload bucket to scow. The low, 150 cy/day, production rate would be associated with loading of soils from deeper excavation depths with multiple equipment maneuvers and longer load and bucket retrieval times as well as unload times to the scow.
2. Excavation bucket sizes of 3 cy and/or 5 cy were assumed, where at deeper excavation depths a smaller 3 cy clamshell or similar crane operated bucket would be assumed. A larger 5 cy bucket was assumed to be used for excavators during shallow saturated soils excavation where equipment could be operated from grade or along the designated vegetated shelf area until the reach of the excavator is exceeded.
3. A 30% porosity was assumed for saturated soils. Therefore, maximum water volume contained in the excavation soils would be 30% of the soil volume excavated.
4. Soil water volumes were calculated in cubic feet (ft^3) and converted to gallons using the conversion factor 1 ft^3 is equivalent to 7.48 gallons (1 ft^3 = 7.48 gallons).
5. The specific gravity of liquids (primarily water) was assumed to be 1.0. No specific gravity (S.G.) or density calculations were performed having assumed a S.G. of 1 for the volume of water to be treated.
6. The number of buckets per day (buckets/day) were calculated based on the low or high daily cy/day production rates divided by the single 3 cy or 5 cy bucket volumes.

7. A minimum of 6 inches (0.5 feet) of free water, the water contained in the excavation bucket that would sit on top of the soils in the bucket as it is retrieved from the turning basin waterway, was assumed to be deposited to scow with excavated soils from the bucket.
8. Excavation bucket dimensions were assumed to coincide with nominal 3 cy and 5 cy volumes, so a dimensional square foot area of the bucket could be obtained (length x width). The length x width dimensions of the excavation bucket along with assumed 0.5 feet of free water height were calculated to generate a daily free water (in gallons) per bucket volume.
9. The daily subtotal volume of excavation water requiring treatment was calculated as the daily free water volume quantities generated plus the 30% pore water volume of the soils with an added 10% contingency to account for stormwater infiltration in scow, secondary containment, and/or treatment equipment, as well as additional capacity to treat equipment decontamination or washdown waters.
10. The pore water volume assumes homogenous, poorly drained soils and does not account for debris or refusal in the materials removed.
11. An 8-hour workday was assumed. It was also assumed that water treatment would occur over 6 hours to allow the treatment system operator 1 hour in the morning for equipment inspections, treatment system start-up, chemical dosing adjustments, etc., and 1 hour in the afternoon to shut-down and secure the treatment system. Total low and high calculated excavation water volume (in gallons) were divided by 6-hour workdays to calculate a range of minimum and maximum required treatment flow rates in gallons per minute (gpm).
12. It was assumed that no water treatment would occur outside of an 8-hour workday and all water treatment for the high, 500 cy/day, excavation production rate would occur within 6 hours.
13. A cost estimate for holding and hauling (hold & haul) the excavation water for treatment was performed for an excavation production rate of 150 cy/day. Whereas, in the event that excavation production rates are not anticipated to exceed 150 cy/day, consideration may be given to perform a cost benefit analyses of the capital cost for treatment system construction plus operator and maintenance cost versus containing excavation water on-site and having it trucked off-site via 7,000 gallon tanker truck for treatment at approved Treatment, Storage, Disposal (TSD) facility.

4.0 CALCULATIONS

4.1 Volume of Water in Excavated Soils

The volume of water contained within the pore space of saturated soils was calculated as follows.

$Vsat\ soil\ pore = \frac{total\ cy}{day} x\ 0.30$ = total cy/day of pore space as per the daily excavation production rate

$Vsat\ soil\ water = \left(\frac{30\%\ total\ cy}{day}\ x\ 27\frac{ft^3}{cy}\ x\ 7.48\frac{gallons}{ft^3}\right)$ = volume of soil water in gallons/day

Where: *V* sat soil pore = volume of water in soil pore space in units of cy/day
V sat soil water = volume of water in soil pore space in units of gallons/day
cy = cubic yards of soil or water
1 cy = 27 ft^3 of soil or water
1 ft^3= 7.48 gallons of water at S.G. of 1.0
0.30 = assumed porosity poorly drained excavated soils

4.2 Volume of Free Water in Excavation Buckets

The free water volumes associated with water contained in excavation buckets, sitting on top of soils, were calculated as follows.

$Vb\ free\ water = L(bucket\ length)\ x\ W\ (bucket\ width) x\ Hf\ (height\ of\ free\ water\ in\ bucket)$ = volume of free water per bucket in units of ft^3/bucket

$Vg\ free\ water = \left(\frac{ft^3}{buckets}\ x\ 7.48 \frac{gallons}{ft^3}\right)$ = volume of free water in gallons/bucket

$Vd\ free\ water = \left(\frac{buckets}{day}\ x\ \frac{gallons}{buckets}\right)$ = volume of free water in gallons/day

Where: *Vb* = volume of free water in excavation bucket in units of ft^3/bucket
*V*g = volume of free water in excavation bucket in units of gallons/bucket
Vd = volume of free water in excavation bucket in units of gallons/day
1 cy = 27 ft^3 of soil or water
1 ft^3= 7.48 gallons of water at S.G. of 1.0
buckets/day = daily excavation production rate in $\frac{cy}{day}\ x\ \frac{\#\ buckets}{cy\ of\ bucket}$

4.3 Total Volume of Excavation Water

The totals of the daily volume of free water plus the daily volume of soil pore water with an added 10% contingency were as follows.

$Vtotal = (Vd\ free\ water + V\ sat\ soil\ water\ ) x\ 1.10$

5.0 SUMMARY

A summary of the daily excavation water volumes and daily design water treatment flow rates are below.

Daily Excavation Production Rate (in cy/day)	Daily Excavation Water Volume (gal/day)	Daily Design Water Treatment Flow Rate (gal/min)[1]
150 cy/day	14,163	40 gpm
500 cy/day	43,609	120 gpm

Notes:
[1] Assumes water treatment occurs over 6 hours during workday.

PROJECT ID: PW77GOWAN
EXCAVATION & CAPPING OF FILLED FIRST STREET TURNING BASIN, GOWANUS CANAL BROOKLYN, NEW YORK

90% SUBMITTAL
CALCULATION PACKAGE

AKRF – KSE Joint Venture
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APRIL 17, 2019

MUESER RUTLEDGE CONSULTING ENGINEERS

FOR: AKRF-KSF Joint Venture
SUBJECT: First Street Turning Basin

TABLE OF CONTENTS

DESIGN NARRATIVE

Project Description

The First Street Turning Basin site is proposed to be excavated, connected to Gowanus Canal and repurposed for small craft navigation.

The Support of Excavation system selected for excavation of the basin comprises interlocked pipe pile walls filled with concrete. The SOE walls are designed to facilitate excavation in the wet to reduce the differential loads and hence the structural requirements for the SOE walls and reduce construction dewatering volume. The SOE system will also serve as permanent bulkheads for the excavated basin and are designed to function as cantilever walls to avoid the need for external anchorage beyond the basin property lines that would require permanent access agreements. Temporary bracing above the water line and permanent bracing below the sediment cap are provided to maintain lateral wall deflections within acceptable limits.

The new bulkhead comprises 34.5-inch diameter interlocked pipe piles reinforced with a steel core beams along the south side of the basin and 24.5-inch diameter interlocked pipe piles along the north side and east sides; the east side pipe piles will be reinforced with steel core beams. In addition, 20-inch diameter interlocked pipe piles will be installed within the basin to support an intertidal vegetative shelf along the north and east sides.

The interlocks between pipe piles will be treated with a sealant to create low-permeability barriers to minimize groundwater flow through the bulkhead.

Design Basis

The SOE walls are designed to support the full active earth pressures, differential hydrostatic water pressure and uniform construction surcharge loads for all stages of excavation, including bracing installation and removal, as coordinated with the basin excavation. The SOE walls will also serve as permanent bulkheads and are designed to resist permanent lateral ground forces, including uniform live load surcharge, active earth pressure, differential hydrostatic water pressure and seismic earth pressures accounting for liquefied soil conditions. The earth pressures are computed based on existing grades on the north and east sides of the basin and proposed grades on the south side of the basin.

SOE/Bulkhead Design Criteria:

- Design Groundwater Elevation = EL. 3.0 (NAVD88)
- Temporary Construction Surcharge = 600 PSF
- Live Load Surcharge for Permanent Condition= 250 PSF

- Differential Hydrostatic Water Pressure = 2 feet
- Design Earthquake (MCE) = 5.75
- Design Flood Elevation = El. 10 (NAVD88) in AE Zone

Design Methodology

The geotechnical parameters and geological profile used in the SOE/Bulkhead design is based on results of the Geotechnical Exploration and are summarized in a MRCE technical memorandum, dated December 4, 2017.

Anticipated lateral soil loads applied to SOE/Bulkhead walls, and anticipated passive resistance provided by soil to the walls are computed based on soil unit weights and shear strengths provided in the December 4, 2017 memorandum. Similarly, groundwater pressures on SOE walls are determined from groundwater levels observed during the Geotechnical Exploration.

SOE/Bulkhead walls and bracing elements are designed for forces resulting from the applied loads during all stages of construction and permanent condition using Allowable Stress Design, where the nominal member strength is divided by a suitable safety factor. A maximum of 20% overstress in bending is permitted for the temporary case during construction.

Design Considerations

Structural and geotechnical requirements for the design of the SOE/Bulkhead walls are described below.

Global Stability

A global stability analysis of the perimeter walls was performed for three cases; temporary construction phase, service condition and seismic condition. The minimum acceptable safety factor for each case is 1.3, 1.5 and 1.0, respectively. Results of the analyses are summarized in a MRCE technical memorandum, dated December 8, 2017.

Liquefaction Assessment

A simplified liquefaction assessment was performed to evaluate the liquefaction potential of the underlying soils below the ground water table using the Seed and Idriss (1971) simplified procedure, as modified by the NCEER Workshops (Youd et al., 2001). Based on the field SPT N-values recorded in the borings, liquefaction potential was evaluated using a PGA_M of 0.33g for the Maximum Considered Earthquake (MCE) equal to 5.75. The results of the analysis are presented in a MRCE technical memorandum, dated December 12, 2017.

From the analysis, Fill and Sand strata are prone to liquefaction. Liquefied soil properties are estimated using the Idriss & Boulanger (2008) procedures. Seismic soil pressures are computed assuming yielding wall conditions using lateral soil coefficients applicable to the seismic site class. In this case, soil passive resistance above EL. -60 is not considered due to liquefaction. Due to absence of passive soil resistance above EL. -60 and full active driving pressure, the liquefaction criteria governs the design for wall structural capacity, embedment depth, and forces for design of permanent bracing.

Serviceability & Durability

Limiting lateral deflection of the SOE/Bulkhead wall is critical for limiting ground movements behind the walls and potential settlement of adjacent roadways or structures. The design of the SOE/Bulkhead walls is based on limiting lateral deflection of the walls to less than 2.5 inches for the temporary and service conditions, and less than 5 inches for the seismic case (with liquefaction).

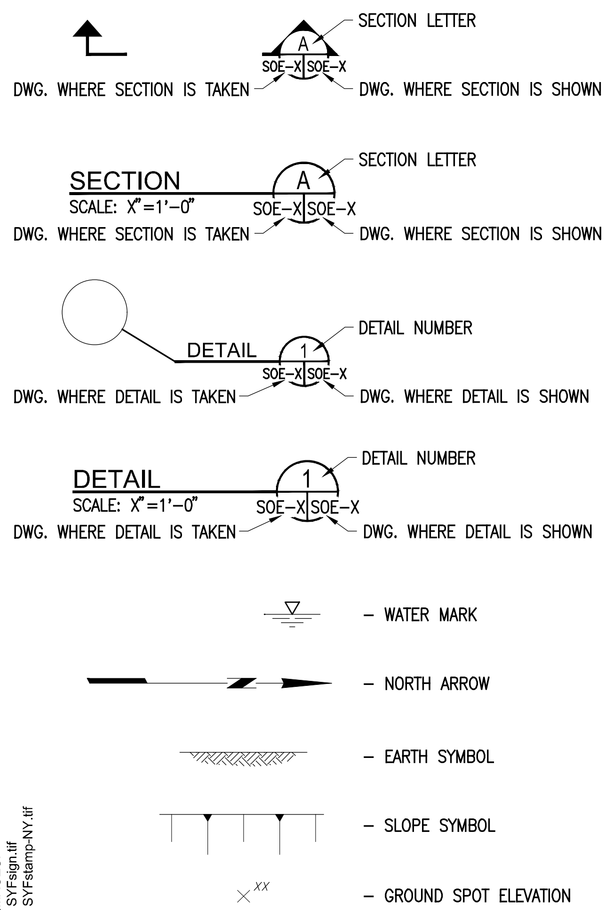
The design of the Bulkhead pipe pile walls incorporates 1/16-inch loss of steel thickness for corrosion allowance. In addition, the pipe piles will be coated with epoxy to a minimum depth below the ground surface, as specified in the Contract Drawings. The permanent bracing below the sediment cap will be galvanized. The concrete bulkhead cap will be reinforced with epoxy coated rebar.

DRAWINGS

LIST OF SOE/BULKHEAD DRAWINGS

DRAWING NUMBER	DRAWING TITLE
T-001	SUPPORT OF EXCAVATION – GENERAL NOTES, LIST OF DRAWINGS, LEGEND AND ABBREVIATIONS
SOE-100	SUPPORT OF EXCAVATION – SITE PLAN
SOE-200	SUPPORT OF EXCAVATION – SEQUENCE OF CONSTRUCTION
SOE-201	SUPPORT OF EXCAVATION – SEQUENCE OF CONSTRUCTION
SOE-202	SUPPORT OF EXCAVATION – SEQUENCE OF CONSTRUCTION
SOE-300	SUPPORT OF EXCAVATION – PARTIAL PLAN
SOE-301	SUPPORT OF EXCAVATION – PARTIAL PLAN
SOE-400	SUPPORT OF EXCAVATION – SECTIONS
SOE-401	SUPPORT OF EXCAVATION – SECTIONS
SOE-500	SUPPORT OF EXCAVATION – DETAILS
SOE-501	SUPPORT OF EXCAVATION – DETAILS
SOE-600	GEOTECHNICAL INSTRUMENTATION AND MONITORING PLAN
S-100	PERMANENT BULKHEAD BRACING – PLAN
S-101	PERMANENT BULKHEAD BRACING LAYOUT– PARTIAL PLAN AND SECTION
S-102	PERMANENT BULKHEAD BRACING LAYOUT – PARTIAL PLAN AND SECTION
S-200	PERMANENT BULKHEAD – SECTIONS
S-201	PERMANENT BULKHEAD – SECTIONS AND DETAILS
S-400	PERMANENT BULKHEAD CONCRETE CAP – PLAN
S-401	PERMANENT BULKHEAD CAP – PLANS, SECTIONS, AND DETAILS

LEGEND:



ABBREVIATIONS:

BLDG. – BUILDING
B.O. – BOTTOM OF
℄ – CENTER LINE
CL – CHAIN LINK
CLR. – CLEAR
CONC. – CONCRETE
DIA. – DIAMETER
DWG. – DRAWING
DWGS. – DRAWINGS
EL. – ELEVATION
EXIST. – EXISTING
FT. – FOOT, FEET
LG. – LONG
MHW – MEAN HIGH WATER
MLW – MEAN LOW WATER
NO. – NUMBER
NOS. – NUMBERS
O.D. – OUTSIDE DIAMETER
STIFF. – STIFFENER
S.O.E. – SUPPORT OF EXCAVATION
TYP. – TYPICAL
TEMP. – TEMPORARY
T.O. – TOP OF
W.P. – WORK POINT
W/ – WITH
U.O.N. – UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. THE LAYOUT OF SOE SYSTEM SHOWN HEREIN IS BASED ON THE SURVEY DRAWING PREPARED BY B.THAYER ASSOCIATES, DATED OCTOBER 10, 2017.
2. ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. EXISTING GRADE INFORMATION SHOWN ON DRAWINGS HAVE BEEN DEVELOPED BASED ON ELEVATIONS PROVIDED ON TOPOGRAPHICAL AND PROPERTY LINE MAP. EXISTING GRADES AND PROPERTY LINE INFORMATION ALONG THE SOUTH SIDE OF THE SITE IS BASED ON THE PROPOSED POWERHOUSE GRADING PLAN, DATED 5–5–2017.
4. SUBSURFACE SOIL INFORMATION USED FOR THE DESIGN OF THE SUPPORT OF EXCAVATION (SOE) AND BULKHEADS IS BASED ON THE "GEOTECHNICAL INVESTIGATION REPORT" PREPARED BY MUESER RUTLEDGE CONSULTING ENGINEERS, DATED NOVEMBER 15, 2017.
5. CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS SO AS NOT TO DAMAGE EXISTING UTILITIES THAT MUST REMAIN IN OPERATION DURING THE INSTALLATION OF THE SOE. CONTRACTOR SHALL PROTECT AND OR RELOCATE UTILITIES AS REQUIRED. TEST PITS AT RETAINING WALL MAY BE REQUIRED.
6. WORK POINTS FOR THE PERMANENT BULKHEAD ARE USED TO DEFINE THE ALIGNMENT OF THE SOE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SURVEY AND LOCATE THE PERMANENT BULKHEAD AND VERIFY THE VALIDITY OF THE WORK POINTS IN THE FIELD PRIOR TO SOE INSTALLATION. THE CONTRACTOR SHALL SUBMIT A SURVEY OF THE WORK POINTS FOR APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO START OF WORK.
7. THE TOP OF SOE AND BULKHEAD WALL ELEVATIONS VARY. TOP OF BULKHEAD WALL ELEVATIONS SHALL BE AS SHOWN ON THESE DRAWINGS.
8. FINAL EXCAVATION SUBGRADE ELEVATIONS SHOWN ON THESE DRAWINGS ARE BASED ON CAPPING PLAN AND PROFILE, DRAWING C–101, PREPARED BY ARCADIS.
9. THE BRACING LAYOUT AND SPACING SHOWN ON THESE DRAWINGS SHALL NOT BE ALTERED WITHOUT THE REVIEW AND APPROVAL OF MUESER RUTLEDGE CONSULTING ENGINEERS. ANY PROPOSED ALTERATIONS TO THE DESIGN SHALL BE PERFORMED BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, SUBJECT TO THE APPROVAL OF MUESER RUTLEDGE CONSULTING ENGINEERS.

INTERLOCKED PIPE PILE INSTALLATION NOTES:

1. CONTRACTOR SHALL SUBMIT INTERLOCKED PIPE PILE LAYOUT AND FABRICATION SHOP DRAWINGS INCLUDING WORKING POINTS, DRIVING SEQUENCE AND ELEVATIONS FOR REVIEW.
2. THE CONTRACTOR SHALL INSTALL A GUIDE WALL FOR INSTALLATION OF THE SOE WALL SYSTEMS; SUBMIT DRAWINGS AND DETAILED DESCRIPTION OF THE GUIDE WALLS INCLUDING LOCATION AND ALIGNMENT FOR APPROVAL OF THE OWNER'S REPRESENTATIVE
3. CONTRACTOR SHALL SUBMIT THE PROCEDURE TO ADVANCE INTERLOCKED PIPE PILES INCLUDING THE DETAILS OF THE SYSTEM FOR DRILLING THROUGH OVERBURDEN CASING SHOE, DOWN THE HOLE HAMMER AND WELDED CONNECTIONS FOR APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO START OF WORK.
4. BOULDERS, COBBLES, BRICK MASONRY, STEEL, CONCRETE AND OTHER OBSTRUCTIONS ARE EXPECTED TO BE ENCOUNTERED IN THE FILL LAYER. THE CONTRACTOR IS RESPONSIBLE FOR SELECTING A DRILLING SYSTEM CAPABLE OF ADVANCING INTERLOCKED PIPE PILES THROUGH THE OVERBURDEN TO THE MINIMUM TIP ELEVATIONS SHOWN ON THE DRAWINGS. DOWN THE HOLE HAMMER (DTH) SYSTEM SHALL BE RESTRAINED FROM ADVANCING AHEAD OF THE CASING AND THE CUTTINGS SHALL BE FLUSHED OUT INTERNALLY.
5. PRIOR TO INSTALLATION OF INTERLOCKED PIPE PILES, CONTRACTOR SHALL USE THE PROPOSED SYSTEM TO INSTALL 2 TEST PILES IN THE INTERIOR OF THE SITE TO PROVE THE METHOD AND ENSURE THE OPERATION DOES NOT CAUSE LOSS OF MATERIAL OUTSIDE OF THE CASING WHICH MAY BE DETRIMENTAL TO ADJACENT STRUCTURES.
6. CONTRACTOR SHALL PROVIDE ALL NECESSARY SPECIAL CLOSURES, CONSTRUCTION DETAILS AND INTERLOCKS. SUBMIT SHOP DRAWINGS AND CATALOG CUTS FOR ALL ITEMS FOR THE APPROVAL BY THE OWNER'S REPRESENTATIVE.
7. IT IS EXPECTED THAT THE PILES WILL BE INSTALLED WITHOUT FIELD SPLICING. IN THE EVENT THAT SPLICING OF THE PILES IS REQUIRED, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE. SPLICES SHALL BE FULL PENETRATION BUTT WELDS AND SHALL BE LOCATED IN THE ZONES OF LOW FLEXURAL STRESS AS DETERMINED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL SUBMIT SPLICING DETAILS FOR APPROVAL BY THE OWNER'S REPRESENTATIVE. THE SUBMITTAL SHALL INCLUDE WELDING PROCEDURES AND SHOP DRAWINGS.
8. ALL WELDING OF PIPE PILES AND PILING CONNECTORS SHALL BE IN ACCORDANCE WITH THE PILE AND CONNECTOR MANUFACTURER'S RECOMMENDATIONS.
9. AT THE COMPLETION OF PILE INSTALLATION, SUBMIT COMPLETE AND ACCURATE PILE INSTALLATION RECORDS AND THE AS–BUILT LAYOUT OF THE BULKHEAD WALLS.
10. STEEL SHIMS SHALL BE INSTALLED BETWEEN TEMPORARY WALES AND PIPE PILES TO ENSURE CONTACT AT ALL PIPE PILES.

LIST OF SOE/BULKHEAD SPECIFICATIONS

1. SECTION 03 11 13 – CAST–IN–PLACE
2. SECTION 03 21 00 – REINFORCING STEEL
3. SECTION 03 30 00 – CAST–IN–PLACE CONCRETE
4. SECTION 03 37 26 – UNDERWATER PLACED CONCRETE
5. SECTION 05 05 13.1 – GALVANIZING
6. SECTION 05 12 34 – STRUCTURAL STEEL
7. SECTION 09 96 56 – EPOXY COATINGS
8. SECTION 31 09 13 – GEOTECHNICAL INSTRUMENTATION AND MONITORING
9. SECTION 31 53 01 – TEMPORARY BRACING FOR EXCAVATION
10. SECTION 31 63 34 – DRILLED STEEL PIPE PILES

MATERIAL NOTES:

1. PIPE PILES SHALL CONFORM TO MODIFIED ASTM A252, GRADE 3 WITH A MINIMUM YIELD STRENGTH OF 50 KSI. PIPE PILES SHALL BE EPOXY COATED TO THE MINIMUM ELEVATIONS INDICATED ON DRAWING S–100.
2. STRUCTURAL STEEL SHAPES AND PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A992 OR ASTM A572, WITH A MINIMUM YIELD STRENGTH (Fy) EQUAL TO 50 KSI, UNLESS OTHERWISE NOTED. PERMANENT STEEL BRACING SHALL BE GALVANIZED AND COMPLY WITH THE REQUIREMENTS OF ASTM A123.
3. SHIM PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36, WITH A MINIMUM YIELD STRENGTH (Fy) EQUAL TO 36 KSI.
4. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1 USING E70 LOW HYDROGEN ELECTRODES.
5. TREMIE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
6. CAST–IN–PLACE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
7. REINFORCING STEEL SHALL BE NEW BILLET STEEL EPOXY COATED MEETING THE REQUIREMENT OF ASTM A775, GRADE 60 STEEL.

CONSTRUCTION SEQUENCE:

1. THE SOE INSTALLATION SEQUENCE SHALL BE BASED ON THE MUESER RUTLEDGE CONSULTING ENGINEERS DRAWINGS IN CONJUNCTION WITH THE SPECIFICATION REQUIREMENTS OF THE CONTRACT DOCUMENTS.

INSTRUMENTATION AND MONITORING:

1. PRIOR TO CONSTRUCTION, PRE–CONSTRUCTION CONDITION SURVEY OF ADJACENT STRUCTURES SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION 31 09 13 – GEOTECHNICAL INSTRUMENTATION AND MONITORING.
2. INSTALL INSTRUMENTATION AND MOVEMENT MONITORING POINTS, PERFORM BASELINE MONITORING AND MONITOR ALL EXISTING STRUCTURES, PRIOR TO AND DURING CONSTRUCTION, IN ACCORDANCE WITH SPECIFICATION 31 09 13 – GEOTECHNICAL INSTRUMENTATION AND MONITORING.

SOE DESIGN CRITERIA:

1. DESIGN GROUND WATER ELEVATION = EL. 3.0.
2. TEMPORARY CONSTRUCTION SURCHARGE = 600 PSF.
3. DIFFERENTIAL HYDROSTATIC WATER PRESSURE = 2 FEET.

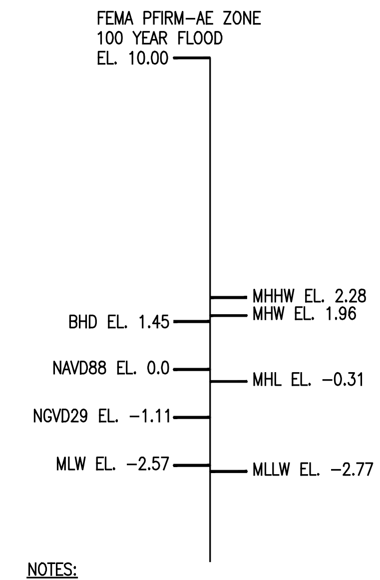
BULKHEAD DESIGN CRITERIA:

1. LIVE LOAD SURCHARGE = 250 PSF.
2. DIFFERENTIAL HYDROSTATIC WATER PRESSURE = 2 FEET.
3. DESIGN EARTHQUAKE (MCE) = 5.75.
4. DESIGN FLOOD ELEVATION = EL. 10 (ZONE AE).

APPLICABLE CODES AND STANDARDS

NYCBC – NEW YORK CITY BUILDING CODE (2014)
AISC – MANUAL OF STEEL CONSTRUCTION
ACI – BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318–14)
ASCE – MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES (ASCE 7–10 SEISMIC)

DATUM AND TIDAL INFORMATION:



NOTES:

1. ELEVATIONS SHOWN REFERENCE NAVD88 (NGVD29).
2. ELEVATIONS SHOWN IN FEET.

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FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
GENERAL NOTES, LIST OF DRAWINGS,
LEGEND AND ABBREVIATIONS
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
T-001.00

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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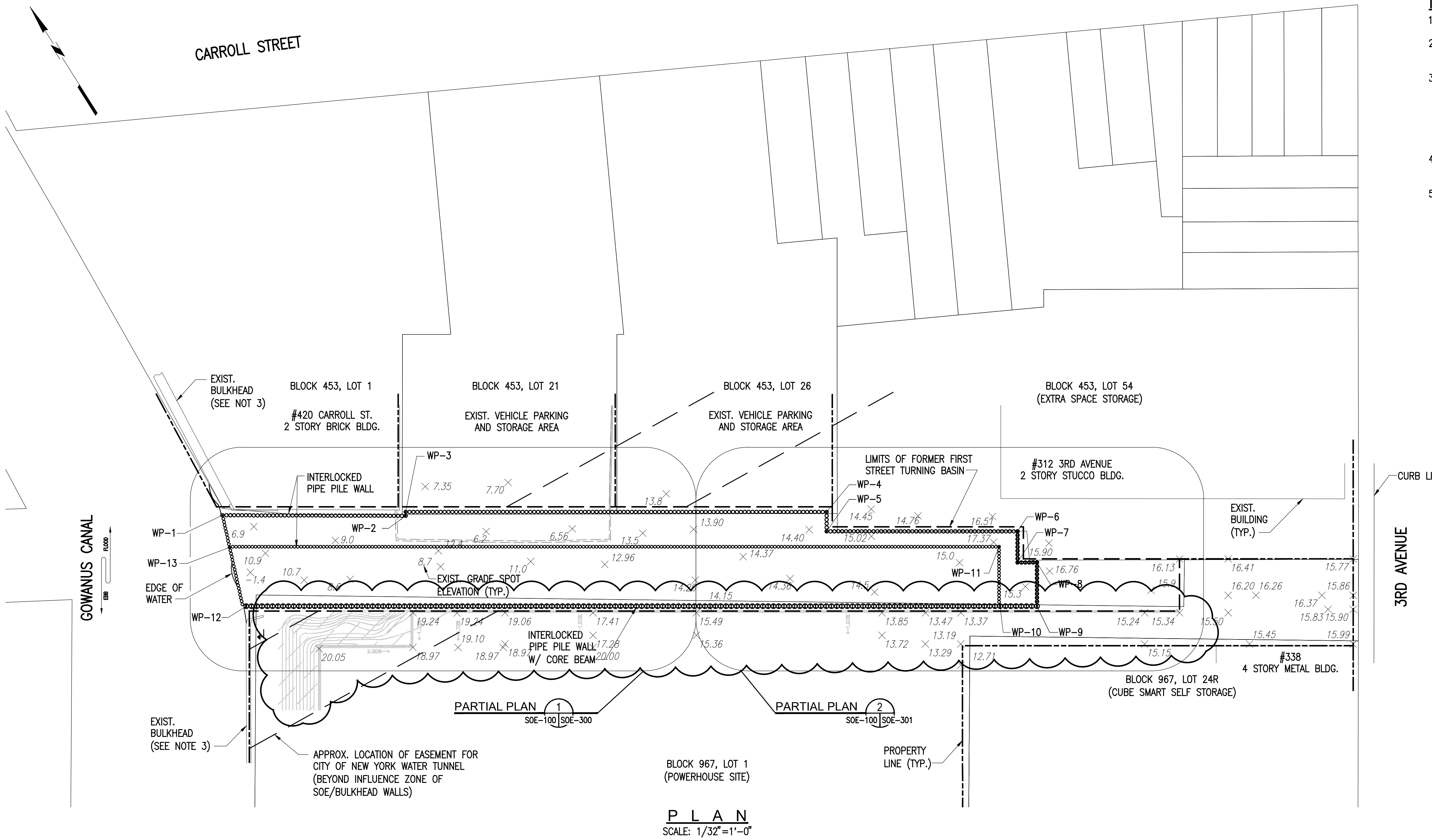

PLAN

SCALE: 1/32"=1'-0"

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING NO. T-001.
2. FOR GENERAL CONSTRUCTION SEQUENCE, SEE DRAWINGS NOS. SOE-200, SOE-201, AND SOE-202.
3. CONTRACTOR SHALL LAYOUT THE NEW SOE BULKHEAD LOCATION AND SUBMIT PLAN SHOWING THE LOCATION AND DETAILS OF THE EXISTING BULKHEAD RELATIVE TO THE NEW BULKHEAD. ANY INTERFERENCE BETWEEN OLD AND NEW BULKHEAD SHALL BE PRESENTED TO THE ENGINEER FOR RESOLUTION PRIOR TO THE START OF WORK.
4. SEE G SERIES DRAWING FOR EXISTING CONDITIONS AND CONTRACTOR STAGING AREAS.
5. SEE C SERIES DRAWING FOR GRADING PROFILE AND DETAILS.

WORK POINT COORDINATE TABLE

WORK POINT NUMBER	NORTHING	EASTING
W.P.-1	186056.0773	987285.6553
W.P.-2	185999.3246	987374.6122
W.P.-3	186001.2201	987375.8152
W.P.-4	185871.3633	987580.5790
W.P.-5	185861.8856	987574.5638
W.P.-6	185802.9691	987667.4658
W.P.-7	185787.8048	987657.8415
W.P.-8	185781.7929	987667.3213
W.P.-9	185760.6077	987653.8758
W.P.-10	185771.9922	987635.9242
W.P.-11	185801.1728	987653.6776
W.P.-12	186004.5623	987269.1978
W.P.-13	186038.3034	987279.2635

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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IMAGES: SYFsign.tif SYFstamp-NY.tif

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01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SITE PLAN

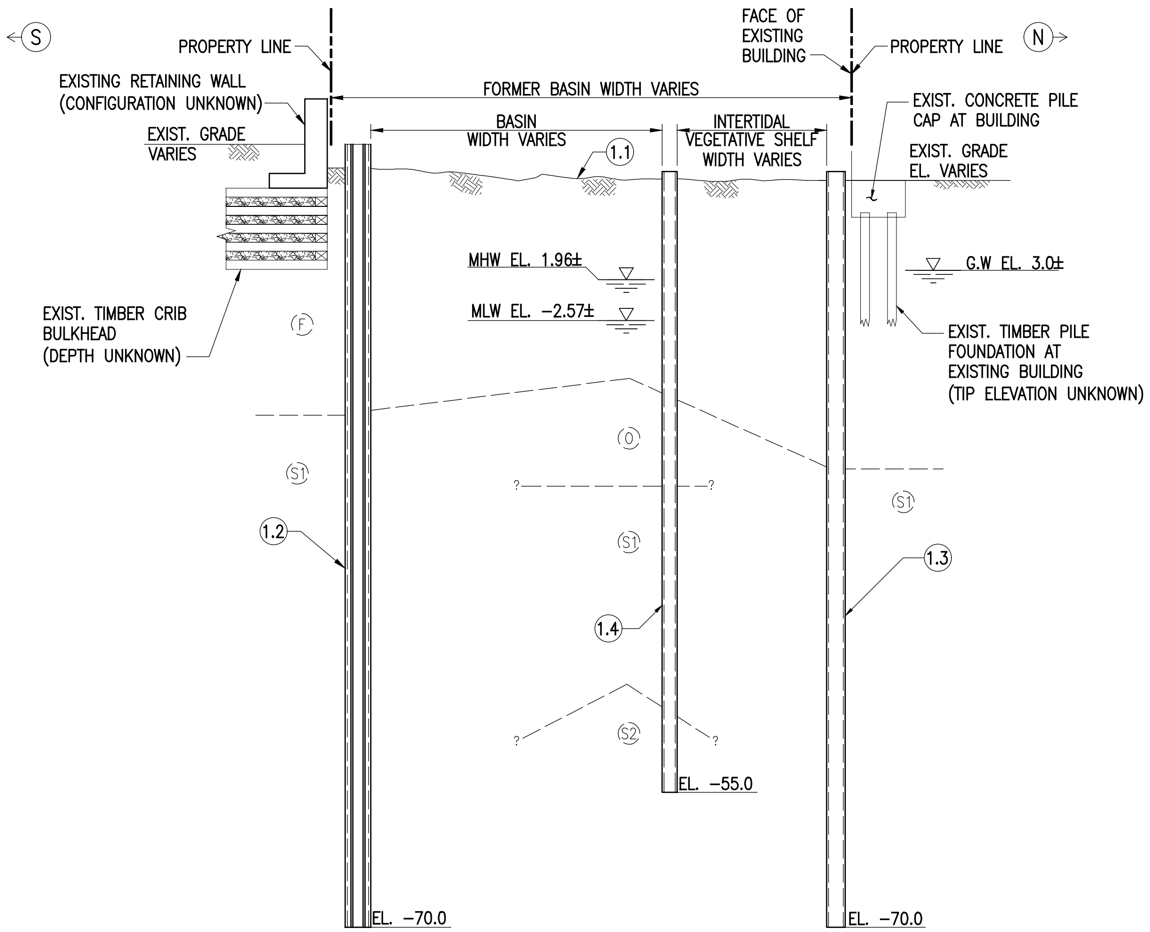
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

The AKRF-KSE JV

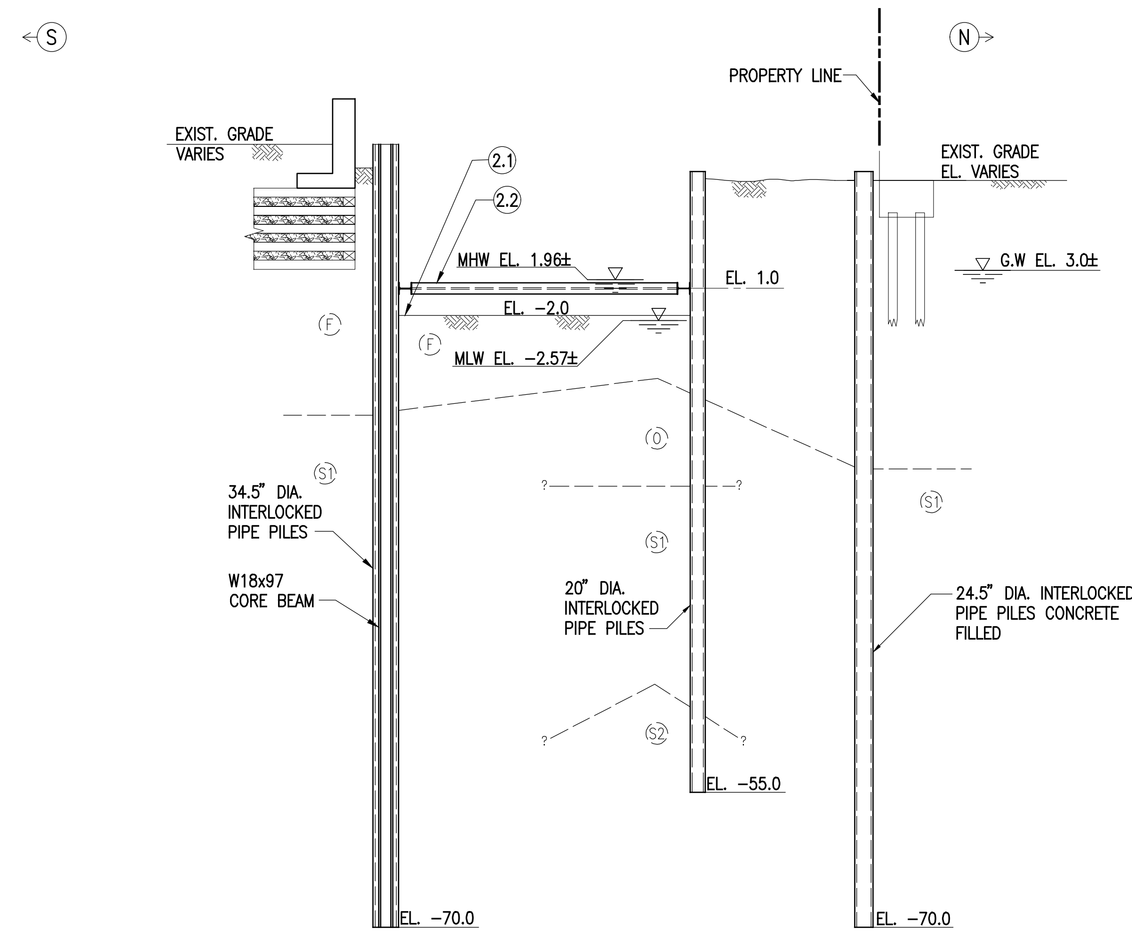
FIGURE
SOE-100.00

NOTES:

1. SOIL STRATA IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. ACTUAL SOIL PROFILE VARIES. SEE GEOTECHNICAL REPORT FOR SUBSURFACE INFORMATION.
2. SECTIONS SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. EXISTING GRADES AND ADJACENT PROPERTIES VARY. SEE SURVEY PLAN FOR EXISTING CONDITIONS.



STAGE 1
INSTALL INTERLOCKED PIPE PILES
SCALE: 3/32"=1'-0"



STAGE 2
EXCAVATE AND INSTALL BRACING
SCALE: 3/32"=1'-0"

GENERAL STRATA DESCRIPTIONS:

- F FILL
- O CLAY
- S1 LOWER SAND
- S2 UPPER SAND

STAGE 1:

1.1 REGRADE SITE AS NECESSARY FOR INSTALLATION OF PIPE PILES.

1.2 INSTALL 34.5" DIAMETER PIPE PILES, CORE BEAMS, AND CONCRETE FILL.

1.3 INSTALL 24.5" DIAMETER PIPE PILES AND CONCRETE FILL.

1.4 INSTALL 20" DIAMETER PIPE PILES AND CONCRETE FILL.

STAGE 2:

2.1 EXCAVATE IN THE WET TO EL. -2.0. MONITOR PIPE STRUCTURES FOR MOVEMENT.

2.2 INSTALL TEMPORARY BRACING AT EL. 1.0.

NOTES:

CONTRACTOR MAY PERFORM STEPS 1.2 THROUGH 1.4 IN ANY ORDER AND CONCURRENTLY TO MEET APPROVED PROJECT SCHEDULE.

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01-03-2019

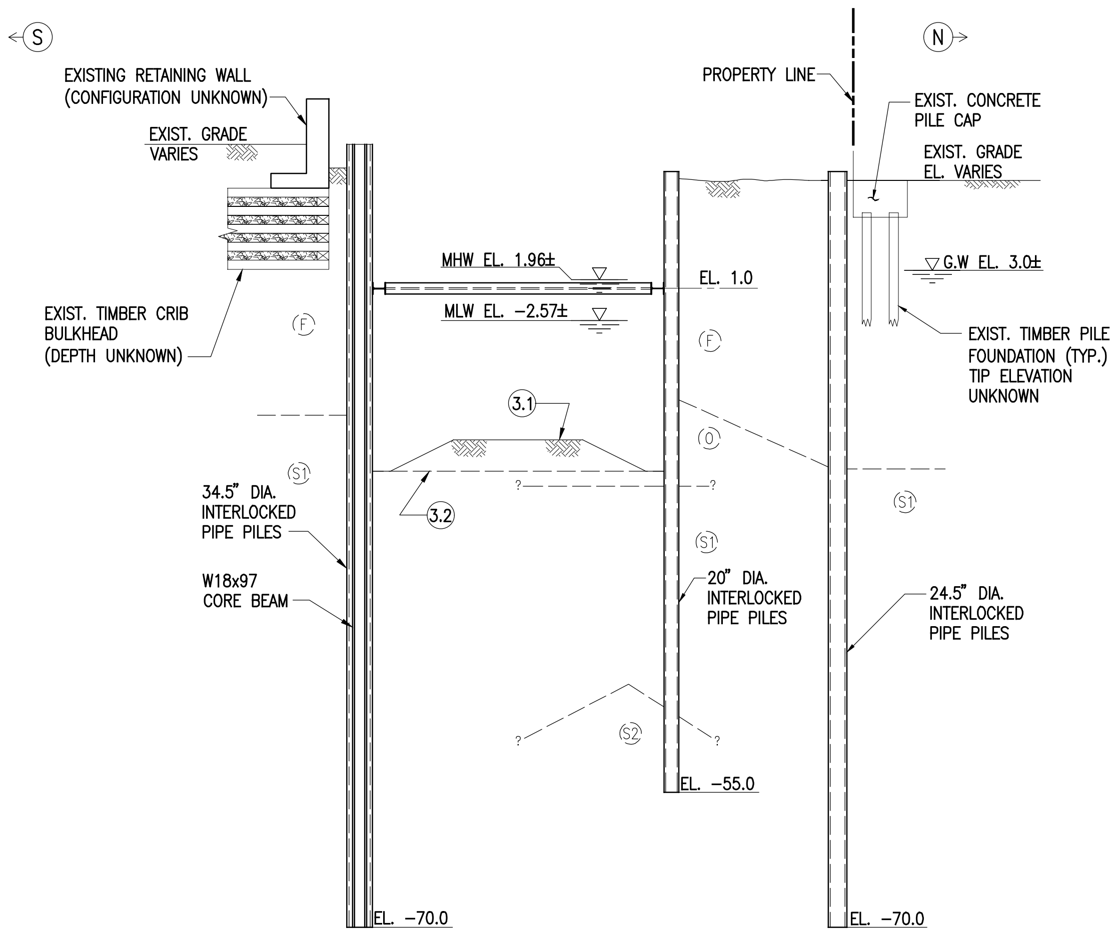
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SEQUENCE OF CONSTRUCTION

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

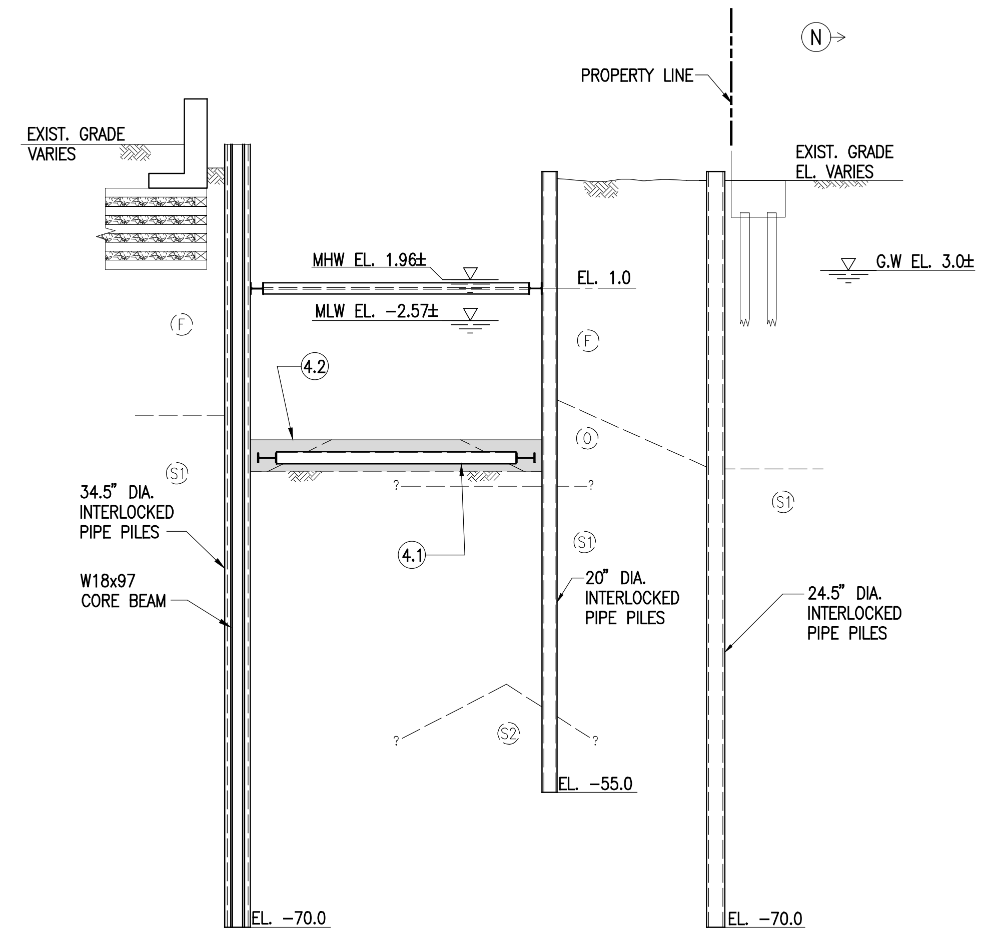
AKRF KSE
The AKRF-KSE JV

FIGURE
SOE-200.00



STAGE 3
EXCAVATE TO FINAL SUBGRADE

SCALE: 3/32"=1'-0"



STAGE 4
INSTALL PERMANENT BRACING

SCALE: 3/32"=1'-0"

NOTES:

1. SOIL STRATA IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. ACTUAL SOIL PROFILE VARIES. SEE GEOTECHNICAL REPORT FOR SUBSURFACE INFORMATION.
2. SEE DWG. NO. S-201 FOR TYPICAL TRENCH DETAILS. SEE DWGS S-101 AND S-102 FOR TRENCH SUBGRADE ELEVATIONS.
3. SECTIONS SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. EXISTING GRADES AND ADJACENT PROPERTIES VARY. SEE SURVEY PLAN FOR ACTUAL CONDITIONS.
4. SEE C-SERIES DRAWINGS FOR CAP SUBGRADE ELEVATIONS.
5. SEE DWGS S-101 AND S-102 FOR TOP OF TREMIE CONCRETE ELEVATIONS.

GENERAL STRATA DESCRIPTIONS:

- F FILL
- O CLAY
- S1 LOWER SAND
- S2 UPPER SAND

STAGE 3:

3.1 EXCAVATE IN THE WET TO SEDIMENT CAP SUBGRADE ELEVATION. MONITOR STRUCTURES. SEE NOTE 4.

3.2 EXCAVATE TRENCHES FOR PERMANENT BRACING INSTALLATION. MONITOR STRUCTURES FOR MOVEMENT. SEE NOTE 2.

STAGE 4:

4.1 INSTALL PERMANENT BRACING WITHIN TRENCHES.

4.2 BACKFILL TRENCHES WITH TREMIE CONCRETE. SEE NOTE 5.

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01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SEQUENCE OF CONSTRUCTION

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

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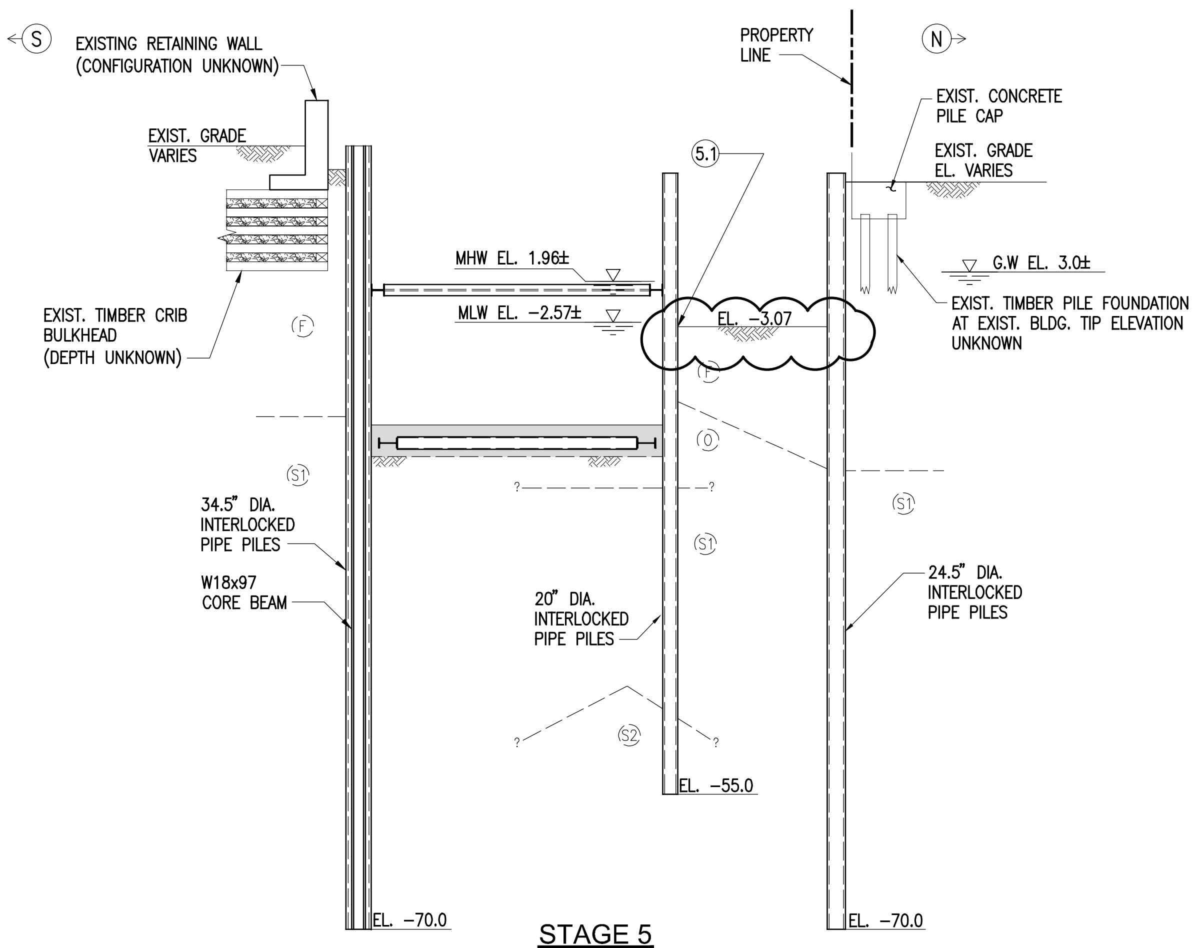
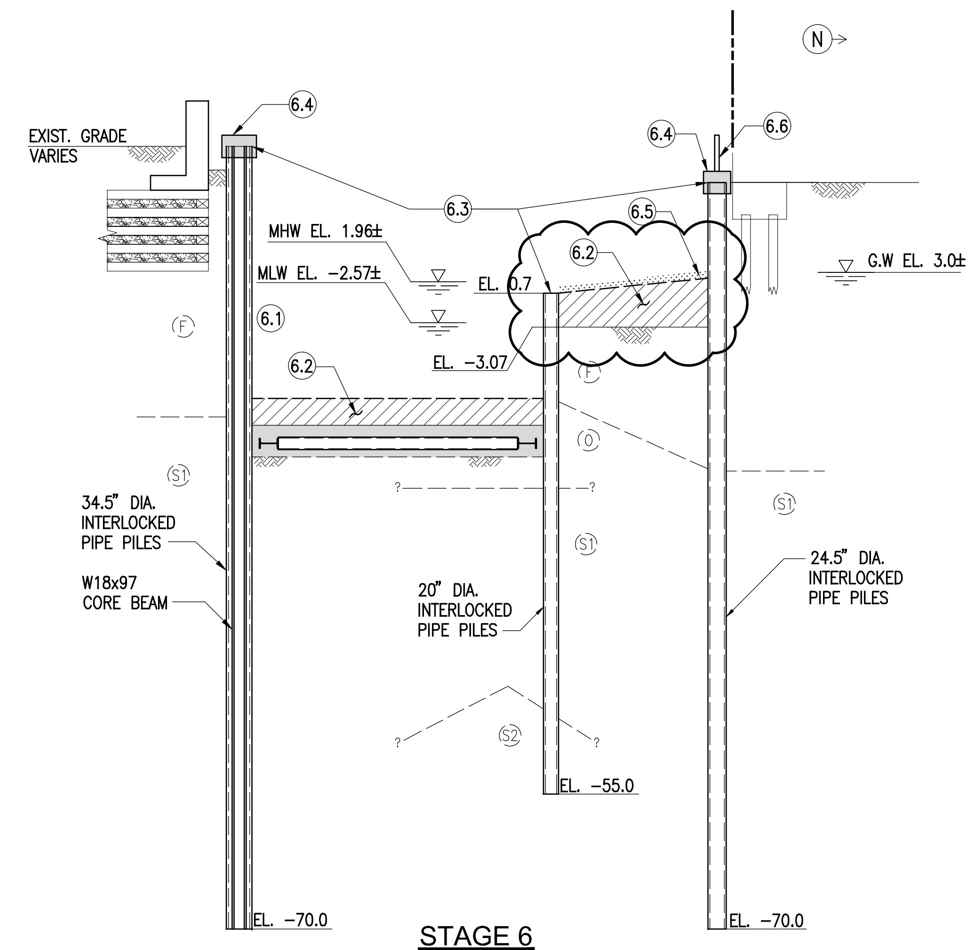
The AKRF-KSE JV

FIGURE
SOE-201.00



STAGE 5
EXCAVATE FOR INTERTIDAL VEGETATIVE SHELF
SCALE: 3/32"=1'−0"



STAGE 6
REMOVE TEMPORARY BRACING, INSTALL SEDIMENT CAPS, CONCRETE BUKHEAD CAP, PLANTINGS, AND FENCE
SCALE: 3/32"=1'−0"

NOTES:

1. SOIL STRATA IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. ACTUAL SOIL PROFILE VARIES. SEE GEOTECHNICAL REPORT FOR SUBSURFACE INFORMATION.
2. SECTIONS SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. EXISTING GRADES AND ADJACENT PROPERTIES VARY. SEE SURVEY PLAN FOR ACTUAL CONDITIONS.
3. SEE C−SERIES DRAWINGS FOR SEDIMENT CAP DETAILS.
4. PILE CUT−OFF ELEVATIONS SHALL BE 1'−0" BELOW TOP OF CONCRETE CAP. SEE DRAWINGS S−101 AND S−102 FOR TOP OF BULKHEAD CONCRETE CAP ELEVATIONS.
5. SEE C−SERIES DRAWINGS FOR FENCE DETAILS.

GENERAL STRATA DESCRIPTIONS:

- F FILL
- O CLAY
- S1 LOWER SAND
- S2 UPPER SAND

STAGE 5:

5.1 EXCAVATE FOR INTERTIDAL VEGETATIVE SHELF. MONITOR STRUCTURES FOR MOVEMENT. SEE NOTE 3.

STAGE 6:

6.1 REMOVE TEMPORARY BRACING. MONITOR PIPE PILES FOR MOVEMENT.

6.2 INSTALL SEDIMENT CAP. SEE NOTE 3.

6.3 CUT−OFF PIPE PILES TO FINAL CUT−OFF ELEVATION. SEE NOTE 4.

6.4 CONSTRUCT CONCRETE CAP. SEE NOTE 4.

6.5 PLACE PLANTING SOIL AND PLANTINGS FOR INTERTIDAL VEGETATIVE SHELF.

6.6 INSTALL FENCE. SEE NOTE 5.

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01−03−2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SEQUENCE OF CONSTRUCTION

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
SOE-202.00

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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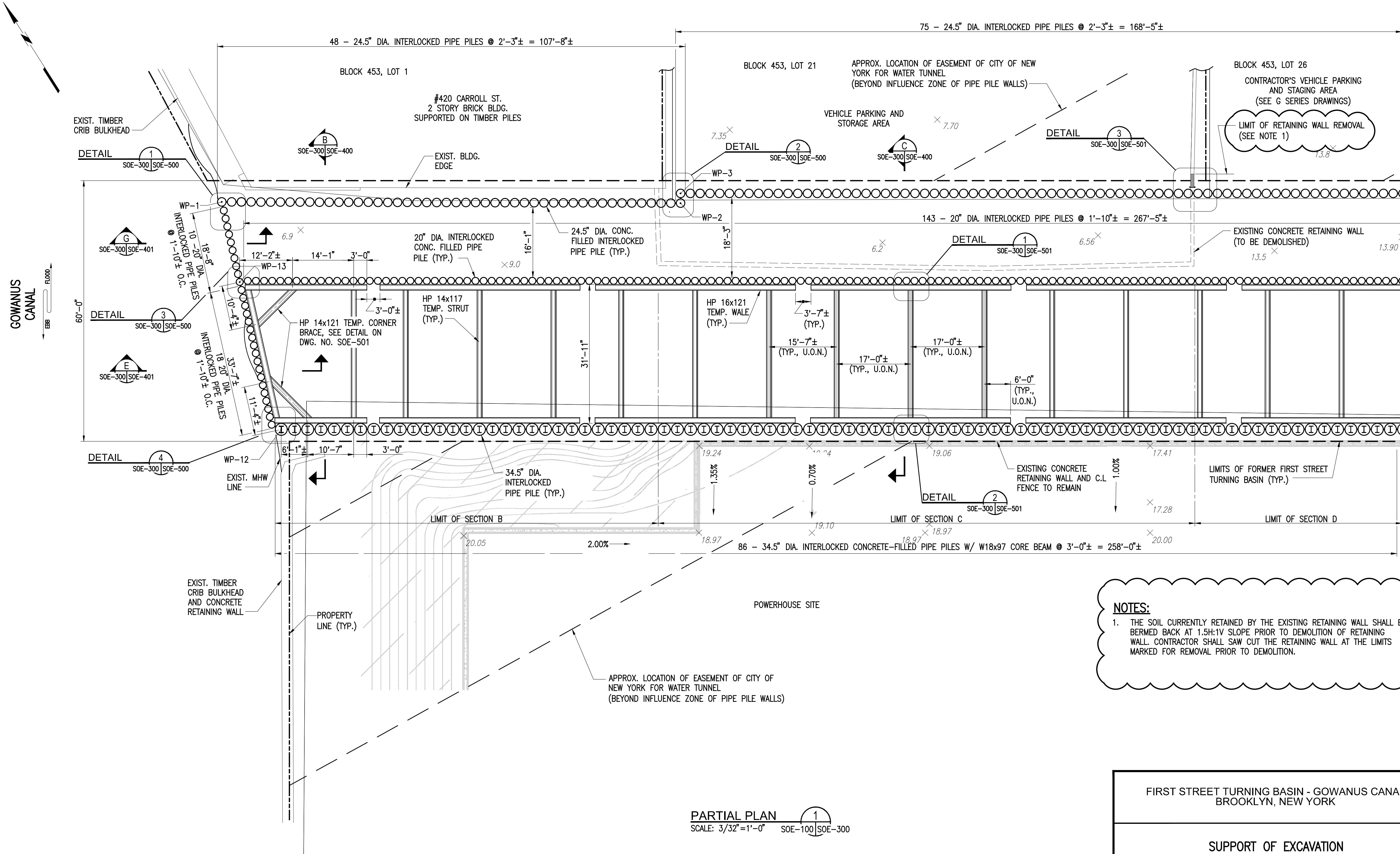

PARTIAL PLAN 1
SCALE: 3/32"=1'–0" SOE–100 SOE–300

NOTES:

1. THE SOIL CURRENTLY RETAINED BY THE EXISTING RETAINING WALL SHALL BE BERMED BACK AT 1.5H:1V SLOPE PRIOR TO DEMOLITION OF RETAINING WALL. CONTRACTOR SHALL SAW CUT THE RETAINING WALL AT THE LIMITS MARKED FOR REMOVAL PRIOR TO DEMOLITION.

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
G:\DWGS\125\12541\SOE-300.00.dwg LAYOUT: LAYOUT1 SAVED: 1/2/2019 5:10 PM ACADVER: 23.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 3/15/2019 6:34 PM BY: SHWETANG KUNDU

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IMAGES: SYFsign.tif SYFstamp-NY.tif

90% - SUBMISSION
01–03–2019

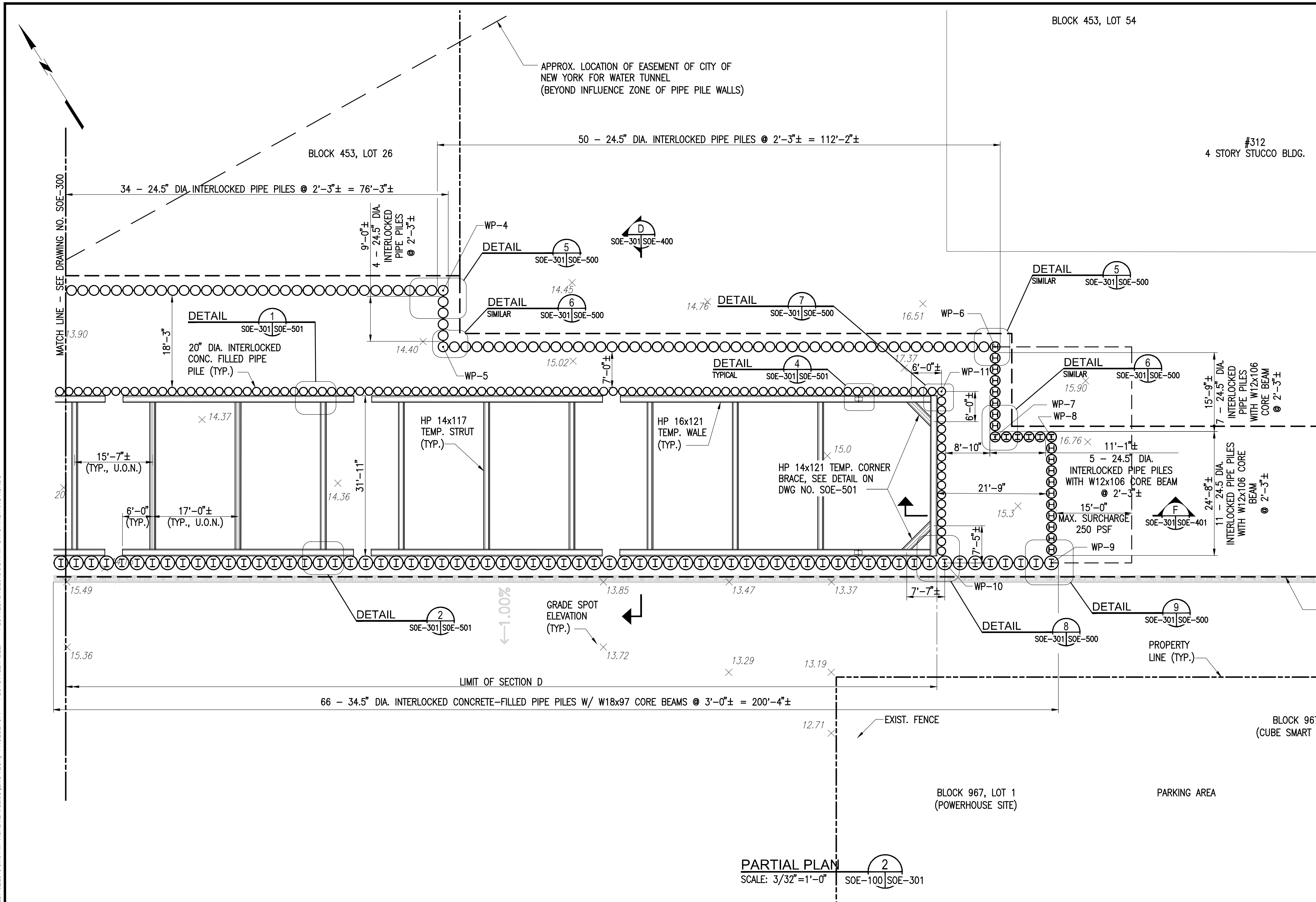
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
PARTIAL PLAN

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
SOE-300.00



PARTIAL PLAN 2

SCALE: 3/32"=1'–0" SOE–100 SOE–301

90% - SUBMISSION

01–03–2019

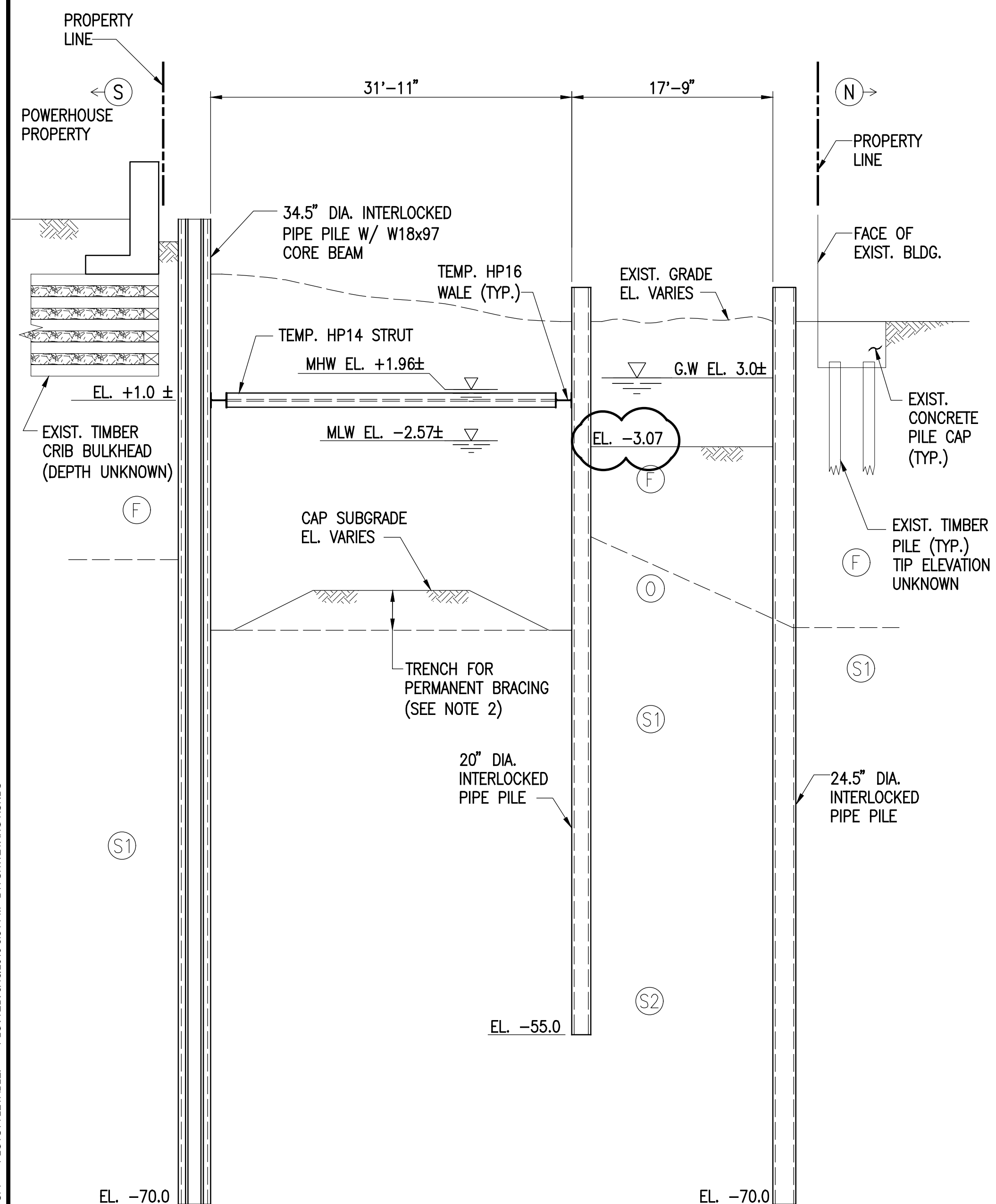
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
PARTIAL PLAN

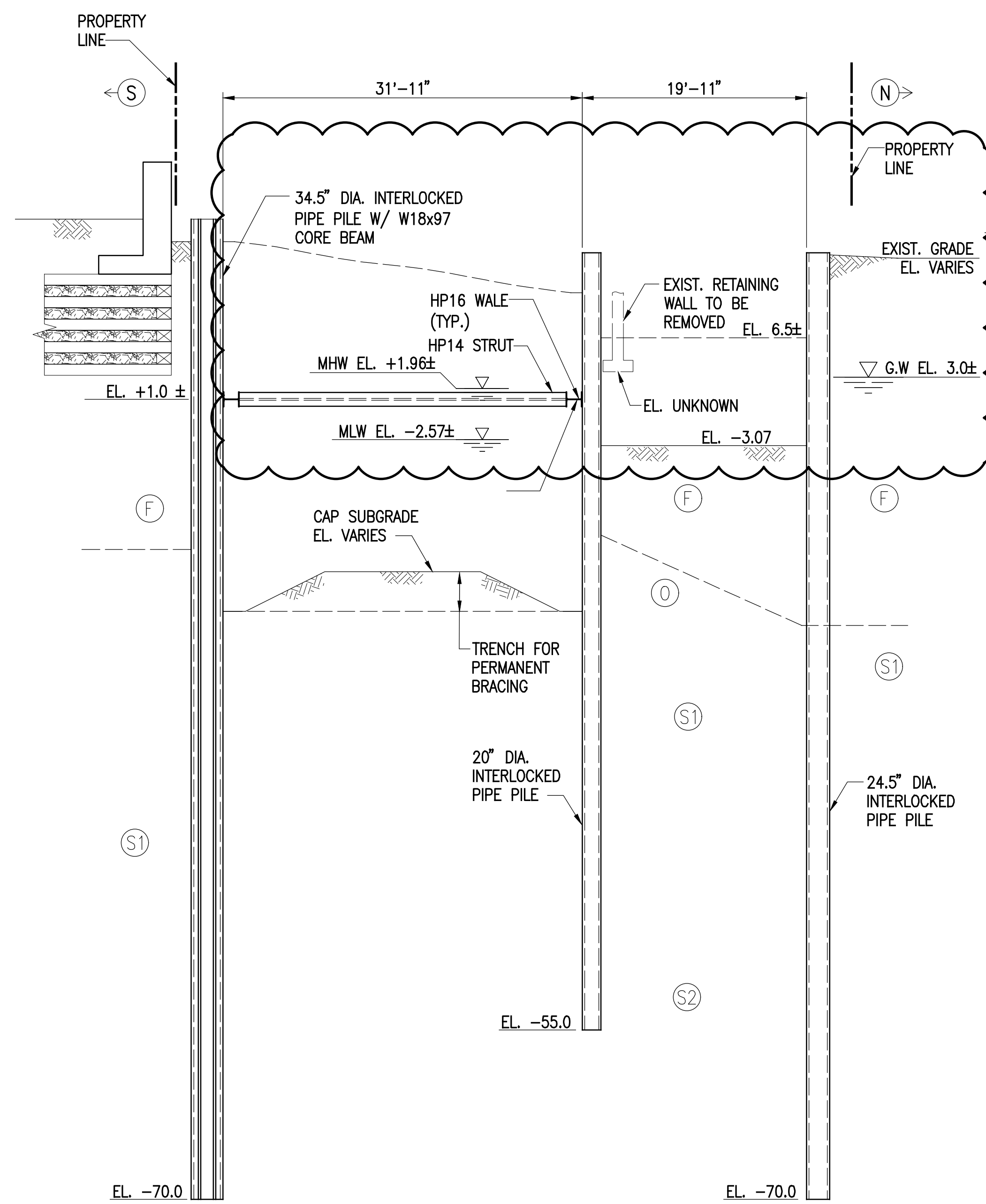
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE The AKRF-KSE JV

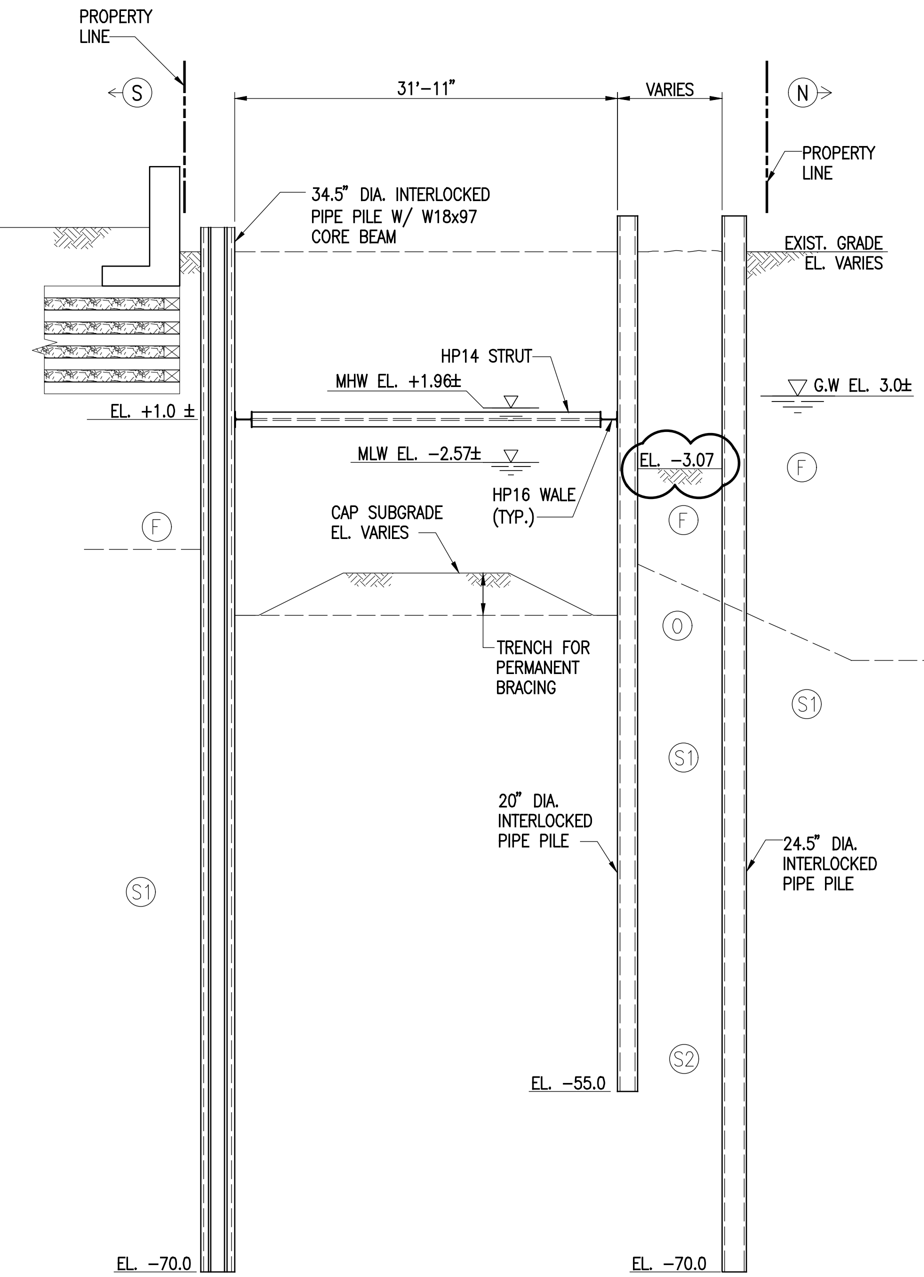
FIGURE
SOE-301.00



SECTION B
SCALE: 1/8"=1'–0"   SOE–300 | SOE–400



SECTION C
SCALE: 1/8"=1'–0"   SOE–300 | SOE–400



SECTION D
SCALE: 1/8"=1'–0"   SOE–301 | SOE–400

NOTES:

1. SOIL STRATA IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. ACTUAL SOIL PROFILE VARIES. SEE GEOTECHNICAL REPORT FOR SUBSURFACE INFORMATION.
2. SEE DWG S–201 FOR TYPICAL TRENCHING DETAIL.

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01–03–2019

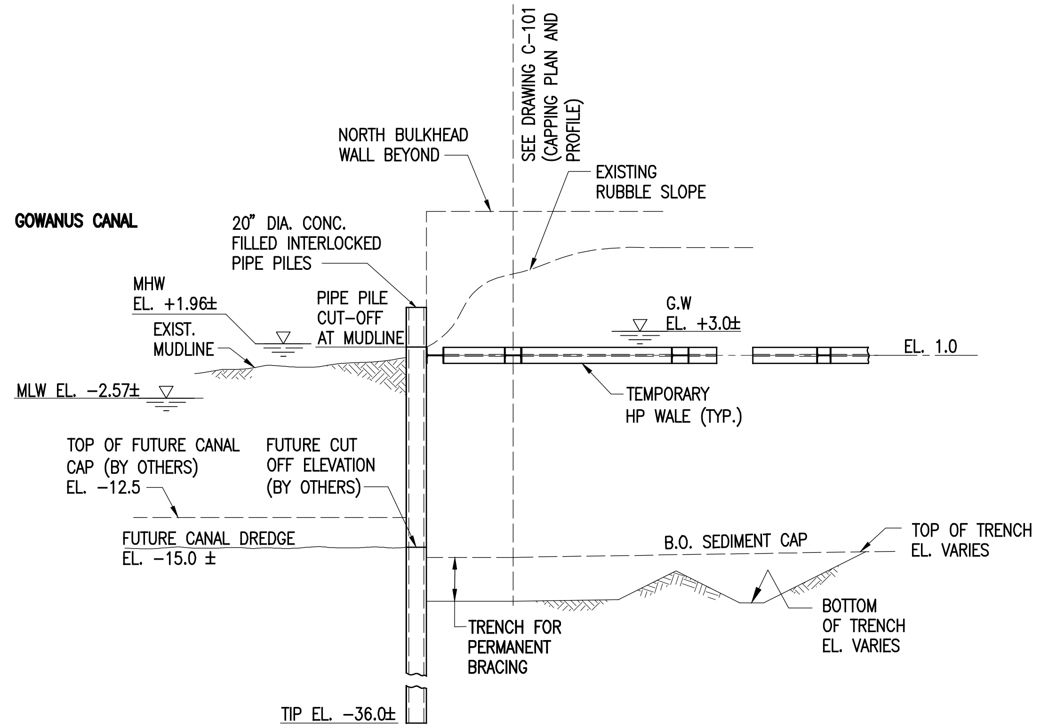
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SECTIONS

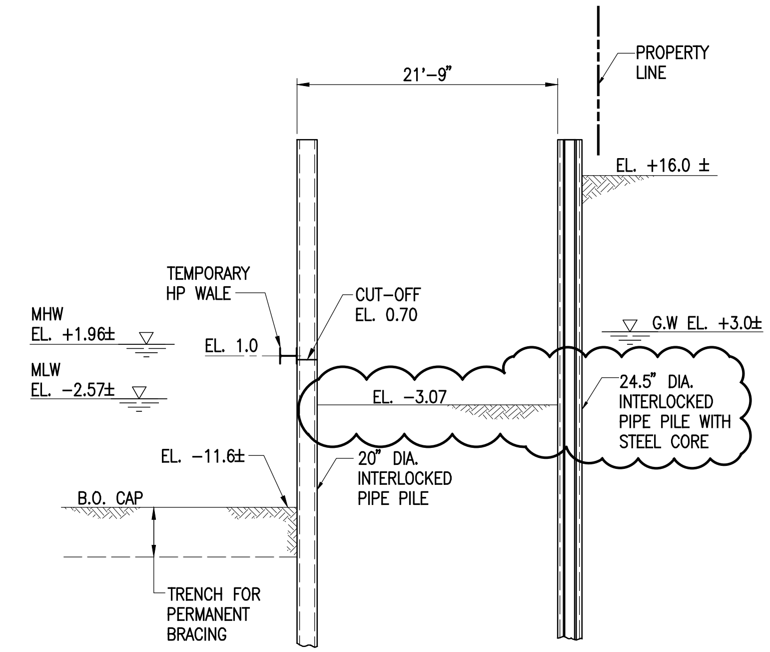
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF | KSE
The AKRF-KSE JV

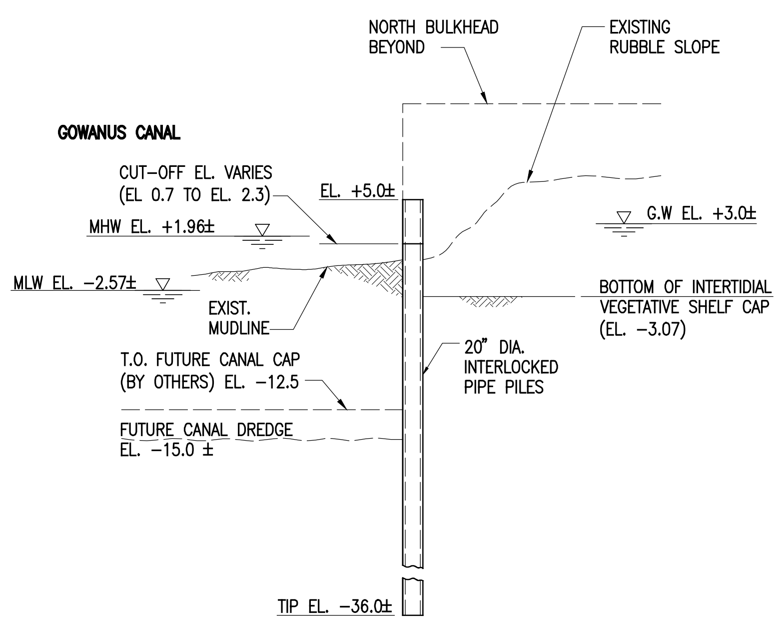
FIGURE
SOE-400.00



SECTION E
SCALE: 1/8"=1'-0" SOE-300 | SOE-401



SECTION F
SCALE: 1/8"=1'-0" SOE-301 | SOE-401



SECTION G
SCALE: 1/8"=1'-0" SOE-300 | SOE-401

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01-03-2019

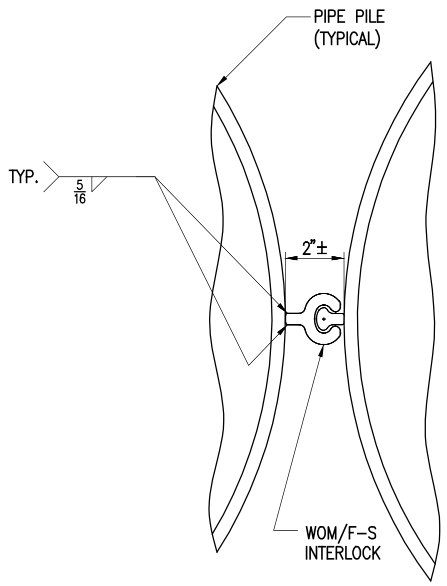
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION
SECTIONS

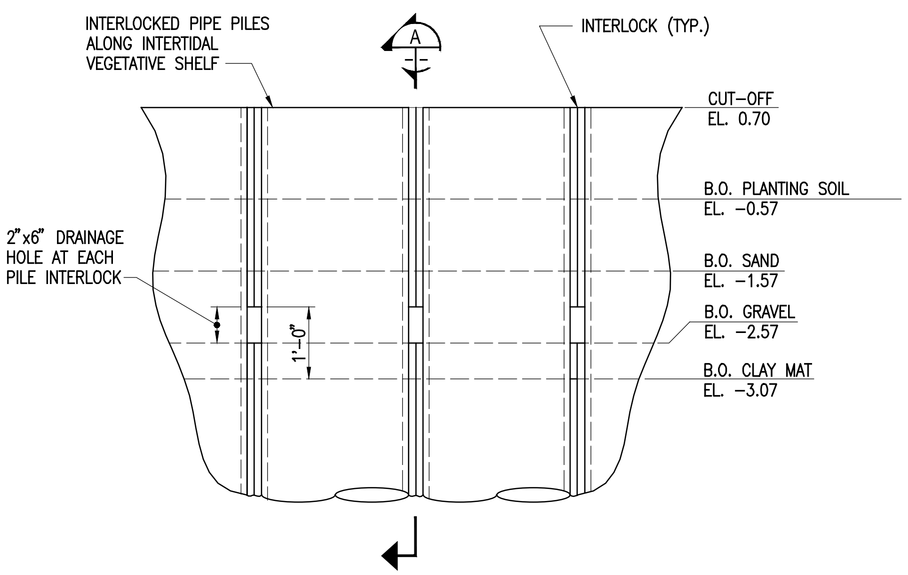
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

The AKRF-KSE JV

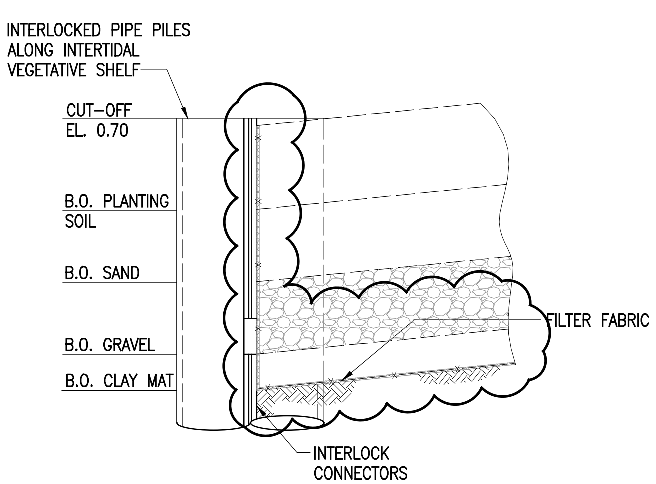
FIGURE
SOE-401.00



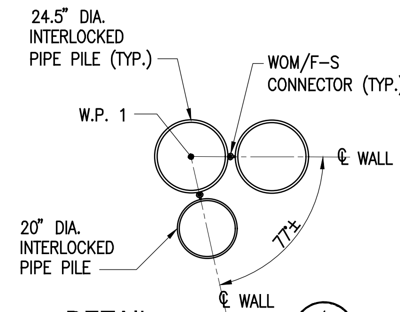
TYPICAL PIPE PILE CONNECTION DETAIL
SCALE: 3"=1'–0"



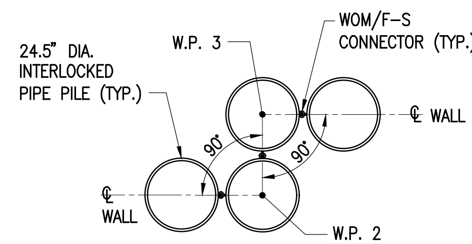
TYPICAL DRAINAGE HOLE DETAIL
SCALE: 3/4"=1'–0"



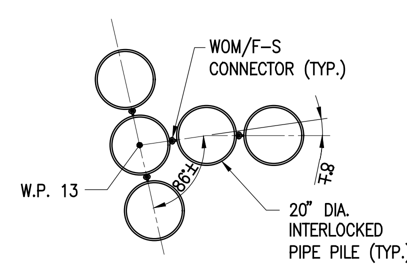
SECTION A
SCALE: 3/4"=1'–0"



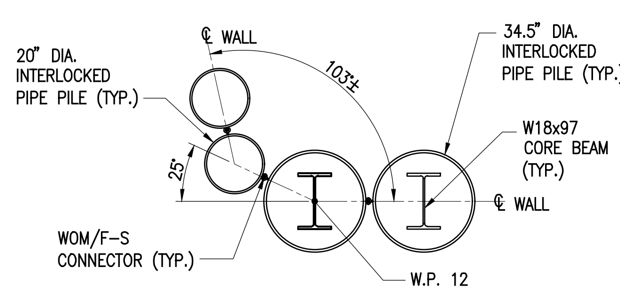
DETAIL 1
SCALE: 3/8"=1'–0" SOE–300 | SOE–500



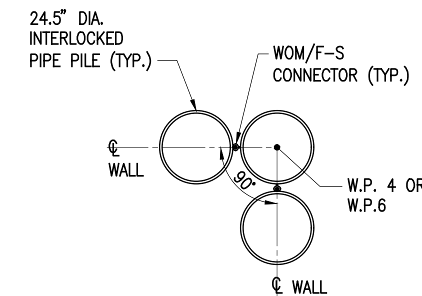
DETAIL 2
SCALE: 3/8"=1'–0" SOE–300 | SOE–500



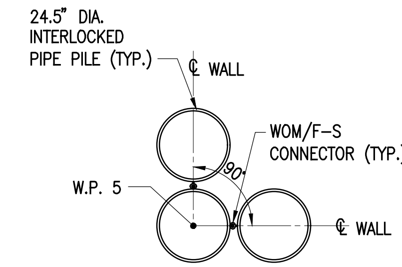
DETAIL 3
SCALE: 3/8"=1'–0" SOE–300 | SOE–500



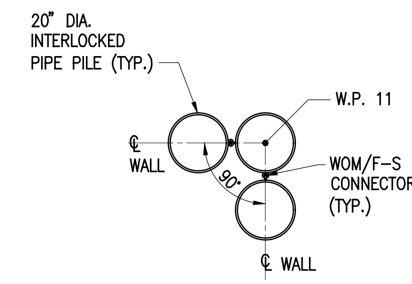
DETAIL 4
SCALE: 3/8"=1'–0" SOE–300 | SOE–500



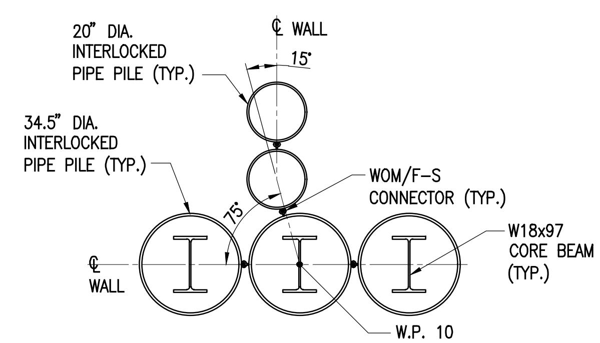
DETAIL 5
SCALE: 3/8"=1'–0" SOE–301 | SOE–500



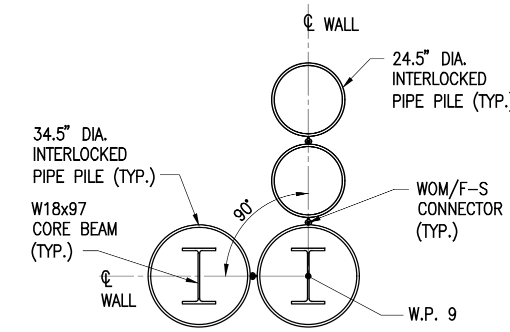
DETAIL 6
SCALE: 3/8"=1'–0" SOE–301 | SOE–500



DETAIL 7
SCALE: 3/8"=1'–0" SOE–301 | SOE–500



DETAIL 8
SCALE: 3/8"=1'–0" SOE–301 | SOE–500



DETAIL 9
SCALE: 3/8"=1'–0" SOE–301 | SOE–500

PIPE PILES:
34.5"x0.875": 152 NOS.
24.5"x.0875": 265 NOS.
20.0"x0.750": 255 NOS.

90% - SUBMISSION
01–03–2019

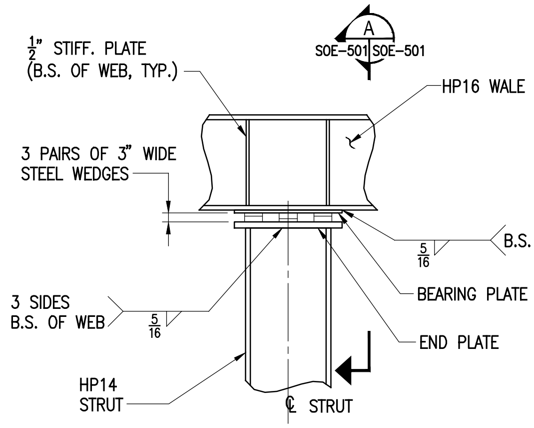
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION DETAILS

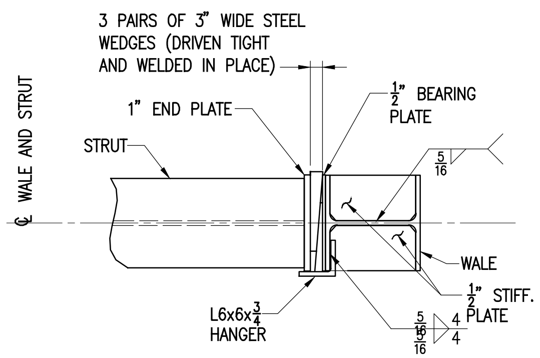
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF | KSE
The AKRF-KSE JV

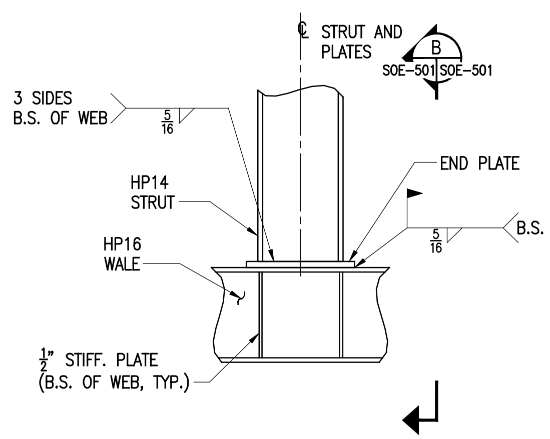
FIGURE
SOE-500.00



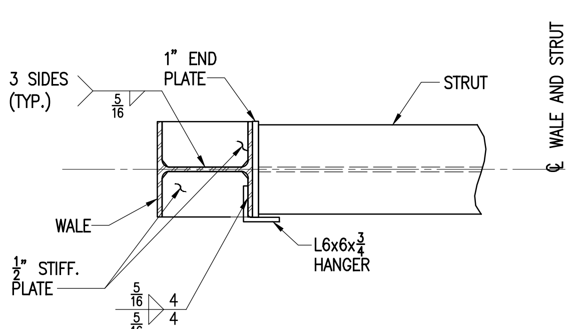
DETAIL 1
SCALE: 3/4"=1'-0"
SOE-300 SOE-301 | SOE-501



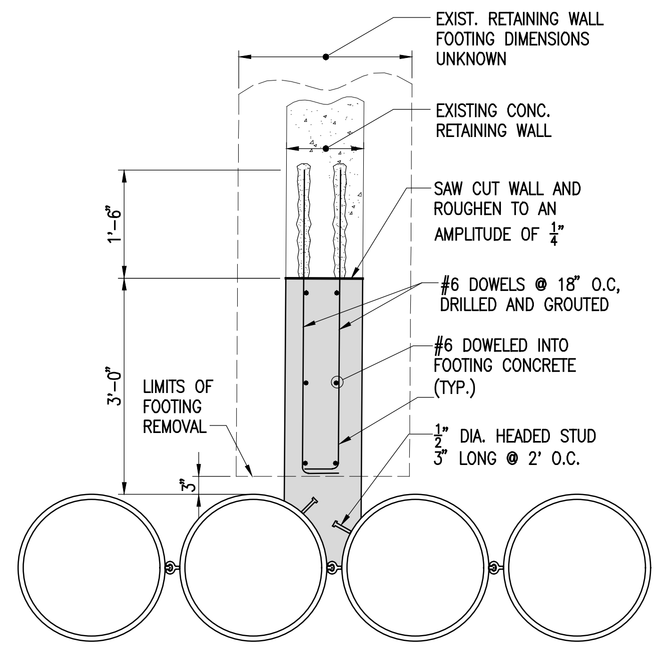
SECTION A
SCALE: 3/4"=1'-0"
SOE-501 | SOE-501



DETAIL 2
SCALE: 3/4"=1'-0"
SOE-300 SOE-301 | SOE-501

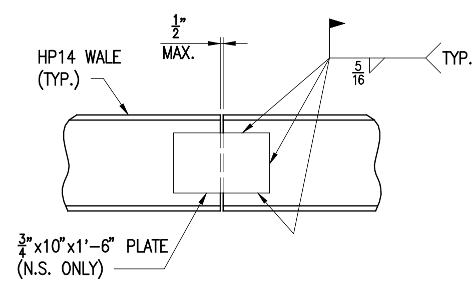


SECTION B
SCALE: 3/4"=1'-0"
SOE-501 | SOE-501

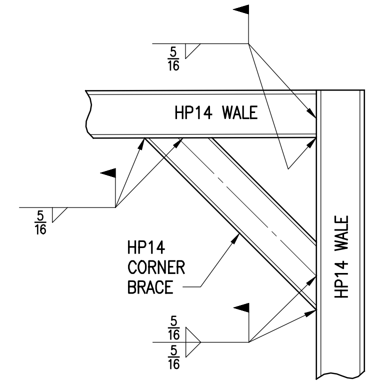


NOTE: EXISTING RETAINING WALL FOOTING SHALL BE SAW CUT WITH 3" CLEARANCE FROM INTERLOCKED PIPE PILE WALL

DETAIL 3
SCALE: 3/4"=1'-0"
SOE-300 | SOE-501



DETAIL 4
SCALE: 3/4"=1'-0"
SOE-301 | SOE-501



TYPICAL CORNER BRACE DETAIL
SCALE: 3/8"=1'-0"

90% - SUBMISSION
01-03-2019

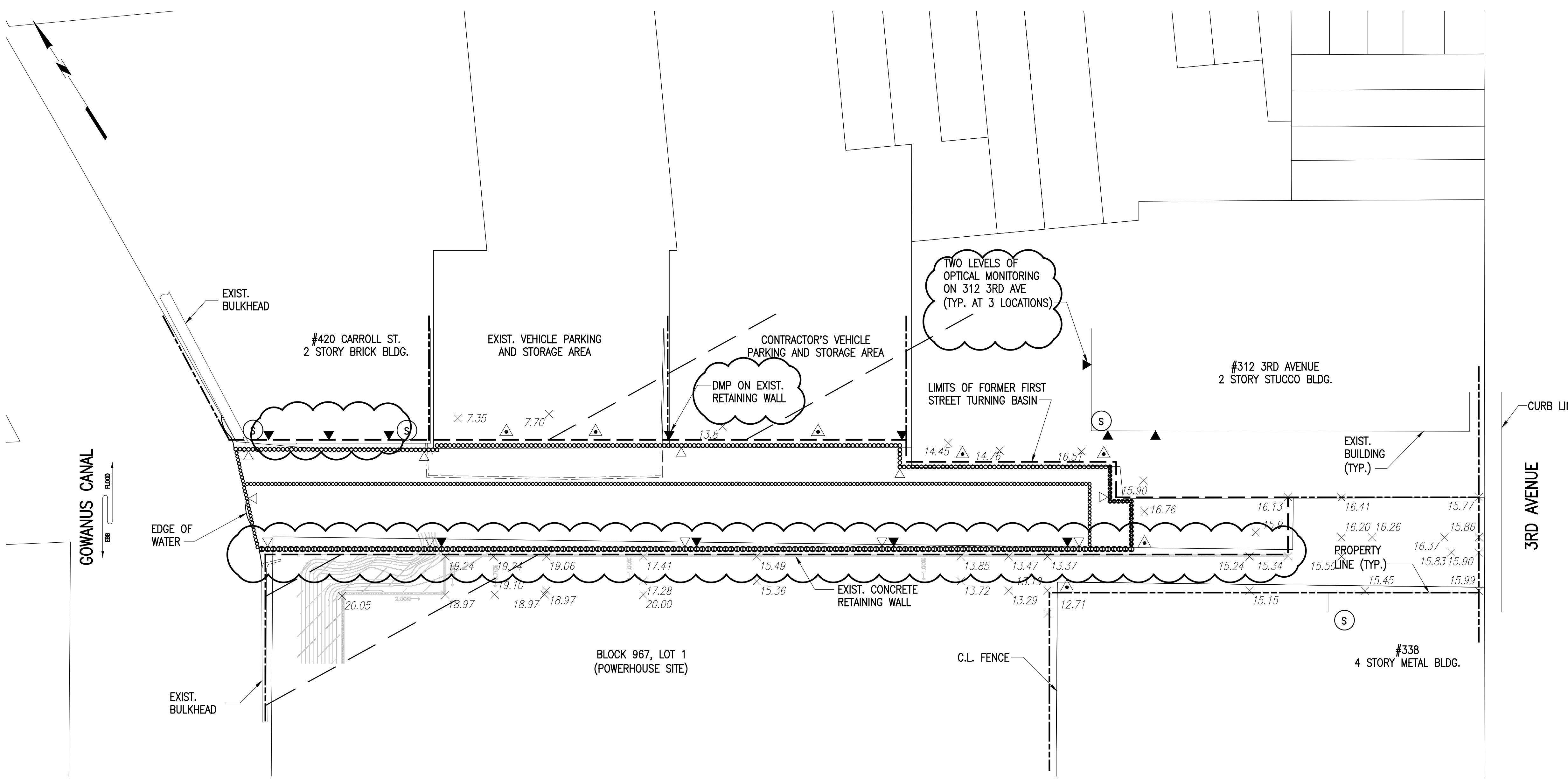
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

SUPPORT OF EXCAVATION DETAILS

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
SOE-501.00



PLAN

SCALE: 1/32"=1'-0"

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING NO. T-001.
2. INSTRUMENTATION LAYOUT SHOWN HEREIN DEPICTS THE MINIMUM REQUIREMENTS. CONTRACTOR SHALL ENGAGE A GEOTECHNICAL INSTRUMENTATION ENGINEER (GIE) LICENSED IN THE STATE OF NEW YORK TO DEVELOP AN INSTRUMENTATION AND MONITORING PLAN AND IMPLEMENT IN ACCORDANCE WITH GEOTECHNICAL INSTRUMENTATION AND MONITORING SPECIFICATION, SECTION 31 09 13.
3. INSTRUMENT LOCATIONS ARE APPROXIMATE AND WILL BE ADJUSTED IN THE FIELD BASED UPON CONDITIONS ENCOUNTERED. FINAL INSTRUMENT LOCATIONS TO BE DETERMINED BY AVAILABILITY OF POWER, SIGHT LINES, ACCESSIBILITY AND FIELD CONDITIONS.
4. ALL INSTRUMENTS SHALL BE INSTALLED AND MAINTAINED BY THE GIE.
5. PRIOR TO INSTALLATION OF THE INSTRUMENTATION, THE CONTRACTOR SHALL PERFORM A PRE-CONSTRUCTION CONDITION SURVEY OF THE EXISTING BUILDINGS AND STRUCTURES IN ACCORDANCE WITH SPECIFICATION 31 09 13.
6. PRE-CONSTRUCTION CONDITION SURVEY SHALL BE PERFORMED AND MONITORING POINTS INSTALLED AT #420 CARROLL ST., RETAINING WALL TO THE EAST OF #420 CARROLL ST., #312 3RD AVENUE, #338 3RD AVENUE, RETAINING WALL TO THE WEST OF #338 3RD AVENUE AND BLOCK 967 LOT 1.

MONITORING LEGEND:

- (S) – SEISMOGRAPH (VIBRATION MONITOR)
- ▲ – DEFORMATION MONITORING POINT (STRUCTURE)
- △ – DEFORMATION MONITORING POINT (SOE)
- △ – DEFORMATION MONITORING POINT (GROUND)

TABLE 1 – MINIMUM MONITORING FREQUENCY AND CRITERIA

INSTRUMENTS	BASELINE	READING FREQUENCY	THRESHOLD CRITERIA	LIMITING CRITERIA
SEISMOGRAPH	ONE WEEK OF CONTINUOUS 15-MINUTE HISTOGRAM PRIOR TO START OF SITE WORK	CONTINUOUS 15-MINUTE HISTOGRAM SUPPLEMENTED WITH A WAVEFORM FOR EVENTS ABOVE THE THRESHOLD CRITERIA. MONITOR CONTINUOUSLY DURING SOE/EXCAVATION/BULKHEAD CONSTRUCTION.	0.5 INCH	1.0 INCH
DEFORMATION MONITORING POINTS (STRUCTURE)	PROVIDE THREE INDEPENDENT READING SETS OF X, Y, Z POSITION 2 DAYS PRIOR TO START OF SITE WORK	MONITOR ALL DMP'S FOUR TIMES PER DAY.	0.25 INCH	0.5 INCH
DEFORMATION MONITORING POINTS (SOE)	PROVIDE THREE INDEPENDENT READING SETS OF X, Y, Z POSITION PRIOR TO START OF EXCAVATION	MONITOR ALL DMP'S FOUR TIMES PER DAY.	1.0 INCH	2.0 INCHES
DEFORMATION MONITORING POINTS (GROUND)	PROVIDE THREE INDEPENDENT READING SETS OF X, Y, Z POSITION PRIOR TO START OF EXCAVATION	MONITOR ALL DMP'S FOUR TIMES PER DAY.	0.25 INCH	0.5 INCH

90% - SUBMISSION
01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

GEOTECHNICAL INSTRUMENTATION AND MONITORING PLAN

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF | KSE
The AKRF-KSE JV

FIGURE
SOE-600.00

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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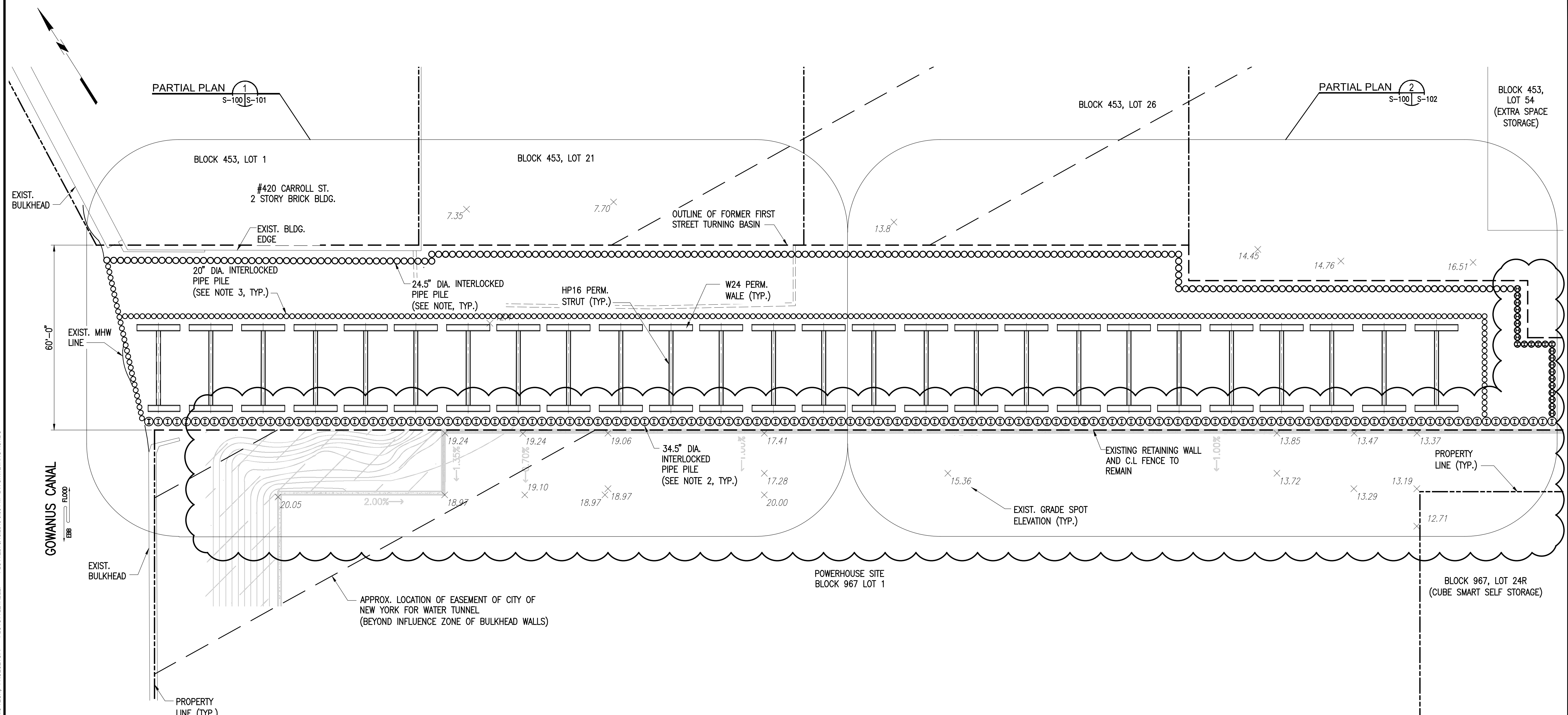
IMAGES: SYFsign.tif SYFstamp-NY.tif



P L A N

SCALE: 1/16"=1'-0"

NOTES:

1. ALL 24.5" DIAMETER PIPE PILES SHALL BE EPOXY COATED FROM CUT-OFF ELEVATION TO MINIMUM EL. -10.
2. ALL 34.5" DIAMETER PIPE PILES SHALL BE EPOXY COATED FROM CUT-OFF ELEVATION TO MINIMUM EL. -20.
3. ALL PERMANENT 20" DIAMETER PIPE PILES SHALL BE EPOXY COATED FROM CUT-OFF ELEVATION TO MINIMUM EL. -20.

90% - SUBMISSION
01-03-2019

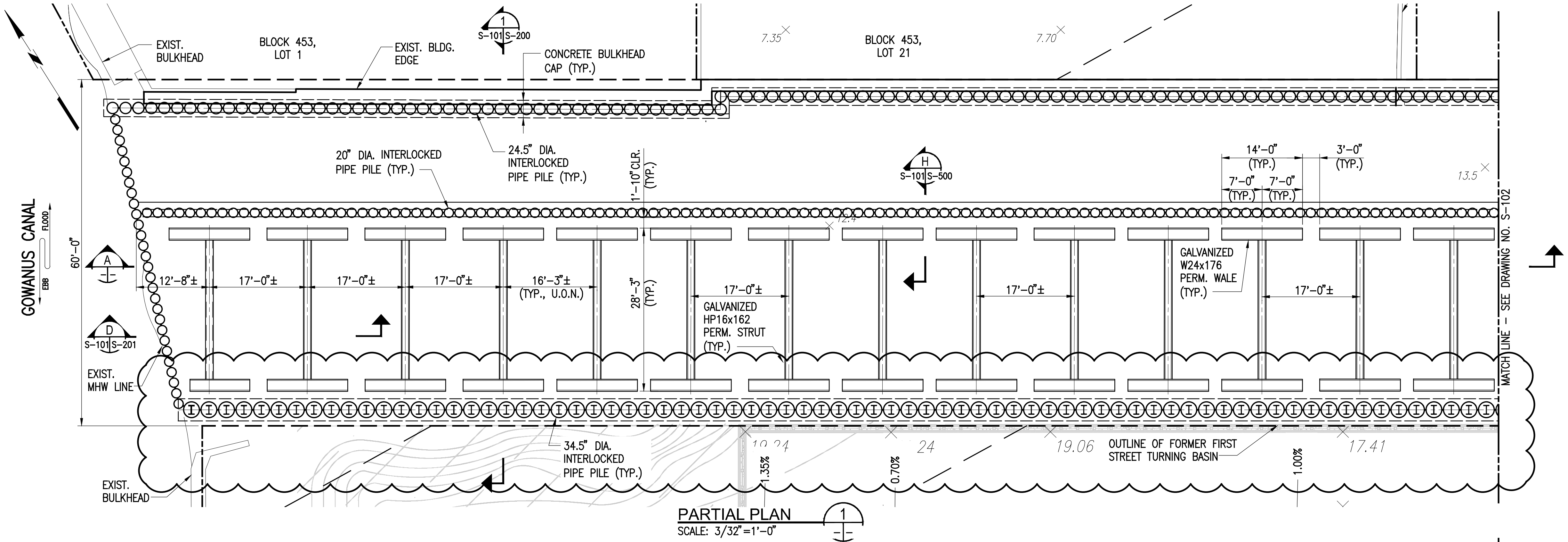
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

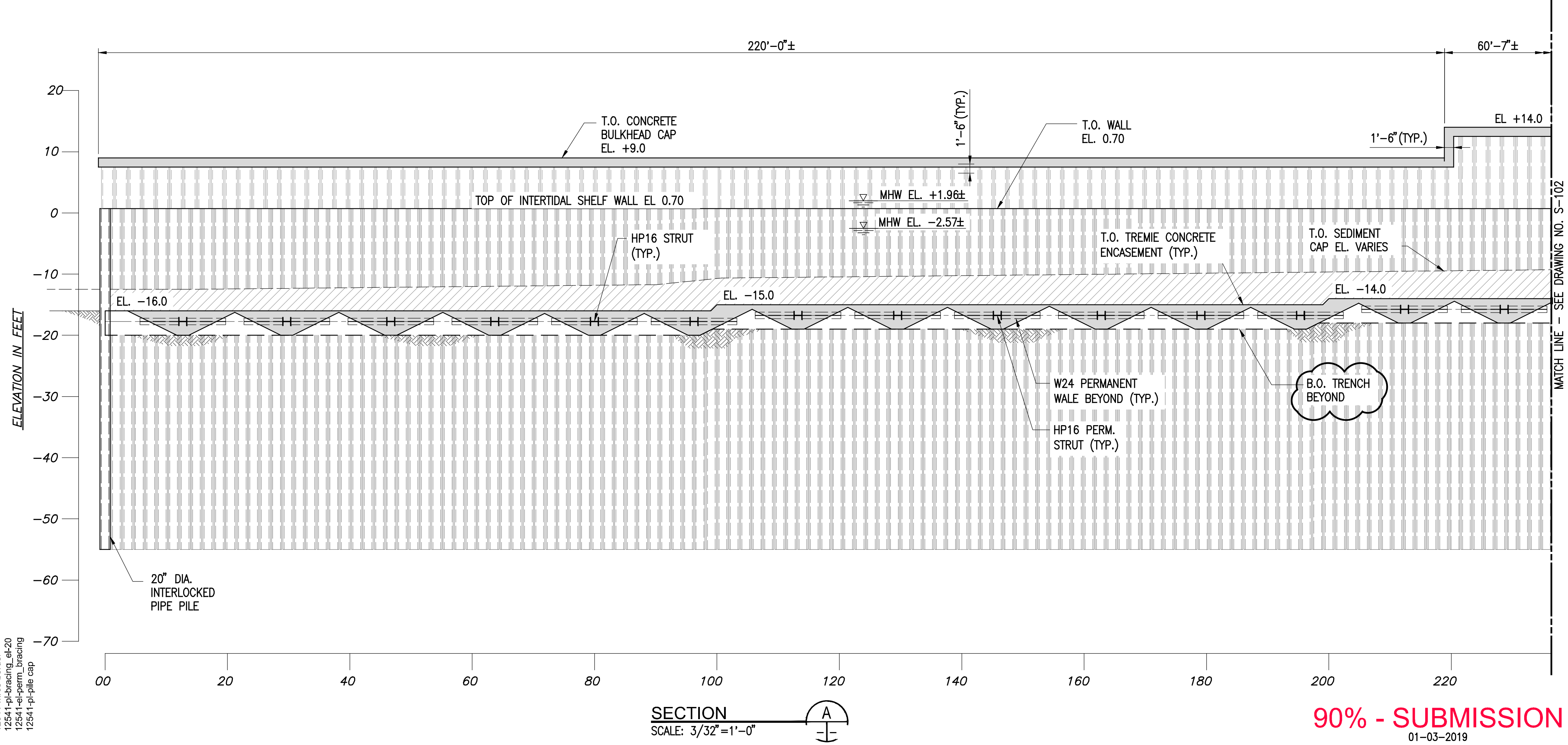
PERMANENT BULKHEAD BRACING
PARTIAL PLAN

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
S-100.00





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12541-mrce-border
12541-pl-bracing_el-20
12541-el-perm_bracing
12541-pl-pile cap

IMAGES:
SYFsign.tif
SYFstamp-NY.tif

90% - SUBMISSION
01-03-2019

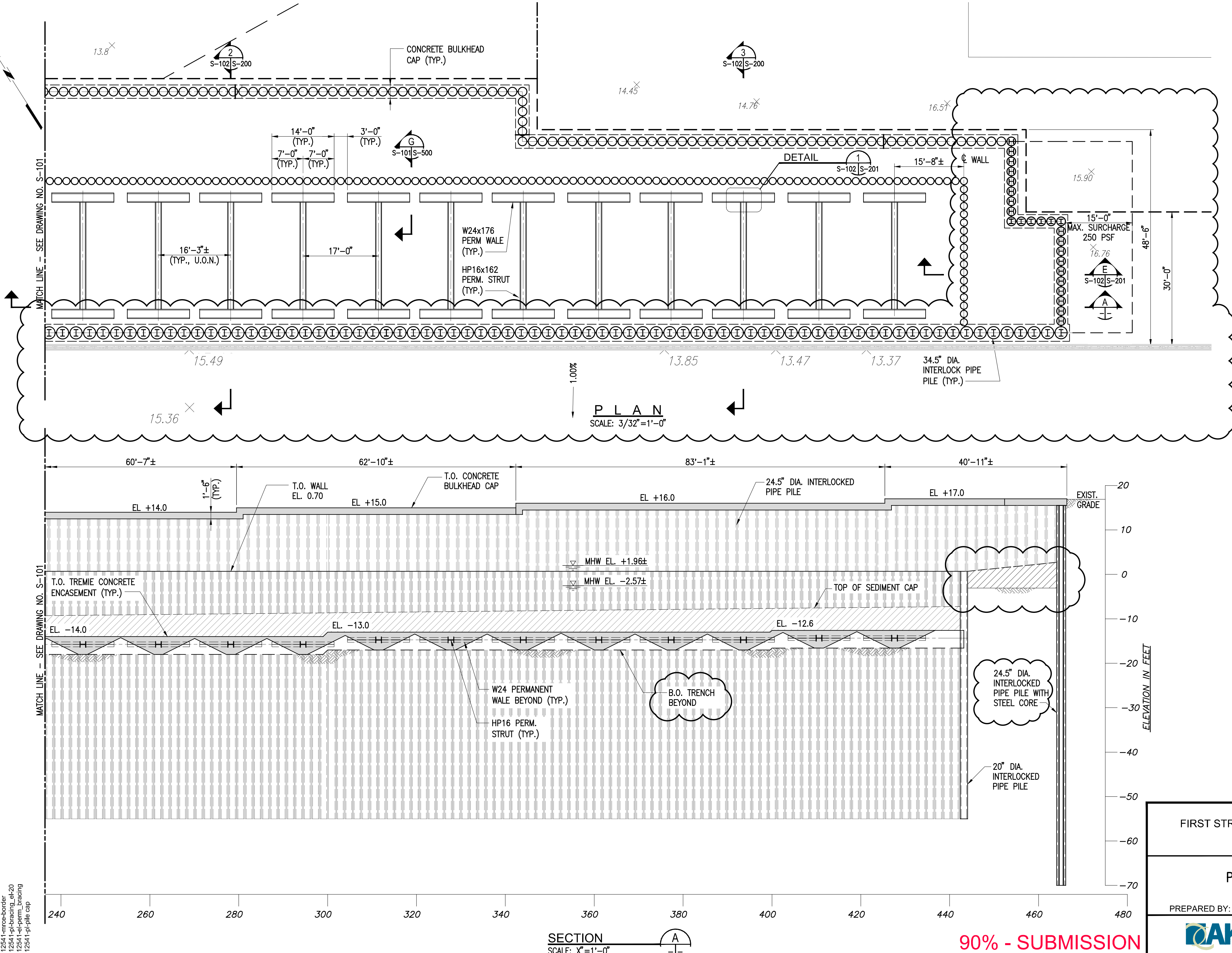
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD BRACING
PARTIAL PLAN AND SECTION

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

The AKRF-KSE JV

FIGURE
S-101.00



90% - SUBMISSION
01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD BRACING
PARTIAL PLAN AND SECTION

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF | KSE
The AKRF-KSE JV

FIGURE
S-102.00

CITY: SAN RAFAEL_CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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12541-pl-soe
12541-mrce-border
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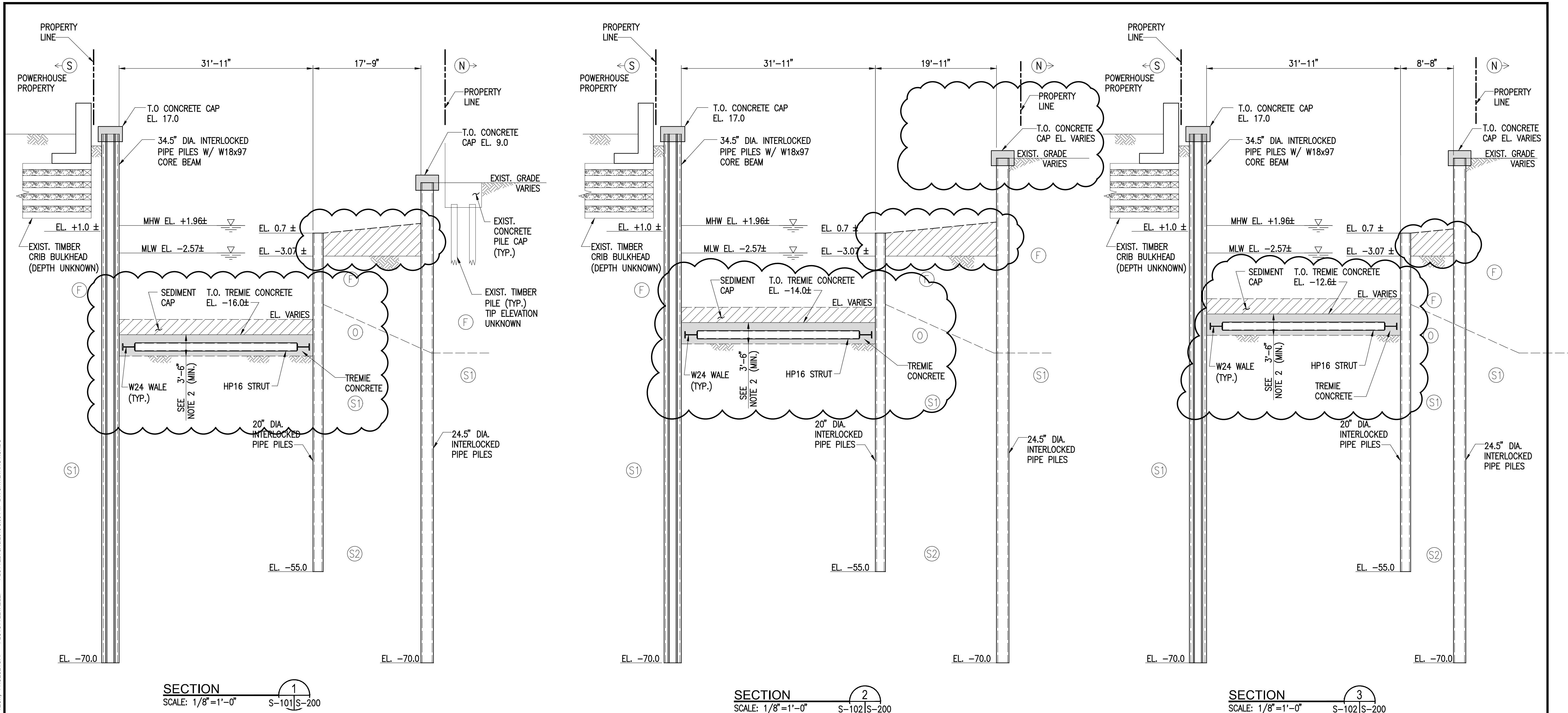
12541-el-perm_bracing
12541-pl-pile cap

IMAGES:
SYFsign.tif
SYFstamp-NY.tif



SECTION 1 S-101 | S-200
SCALE: 1/8"=1'-0"

SECTION 2 S-102 | S-200
SCALE: 1/8"=1'-0"

SECTION 3 S-102 | S-200
SCALE: 1/8"=1'-0"

NOTES:

1. SOIL STRATA IS SHOWN FOR ILLUSTRATION PURPOSES ONLY. ACTUAL SOIL PROFILE VARIES. SEE GEOTECHNICAL REPORT FOR SUBSURFACE INFORMATION.
2. SEE DWG S-201 FOR TYPICAL TRENCH DETAIL.

90% - SUBMISSION
01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD SECTIONS

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

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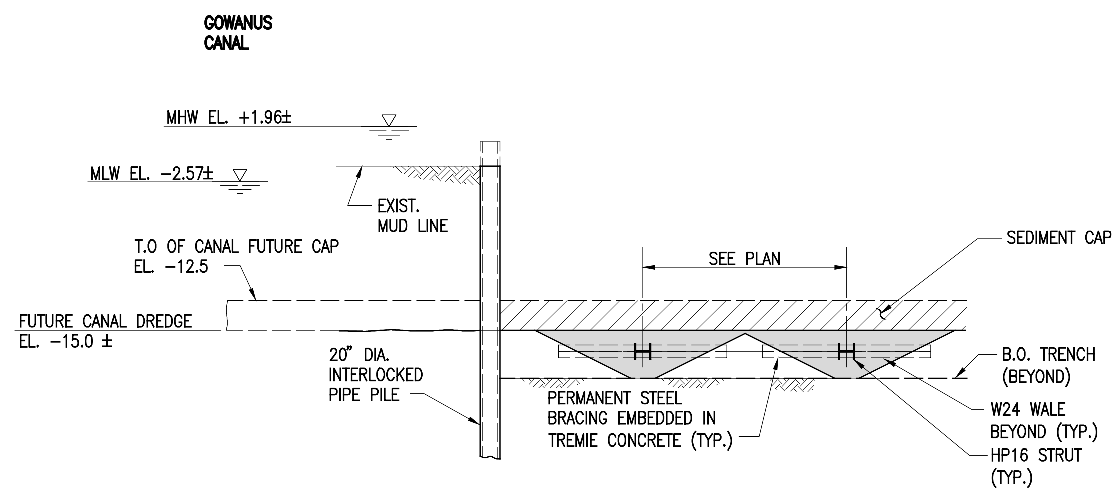
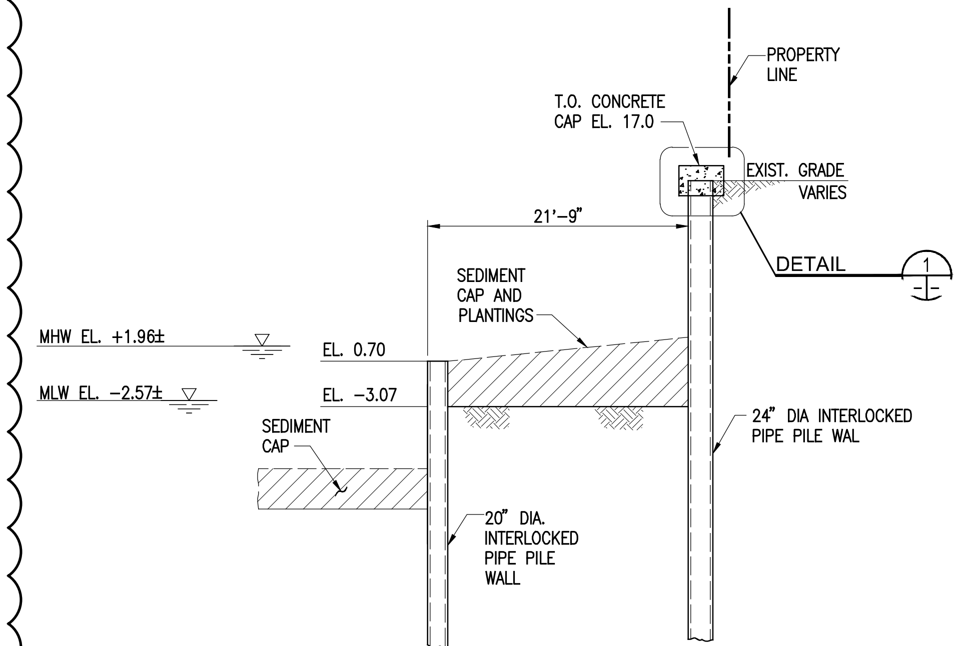
The AKRF-KSE JV

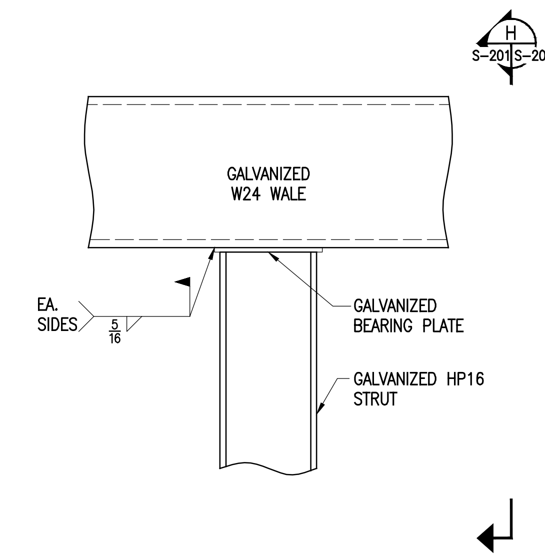
FIGURE
S-200.00



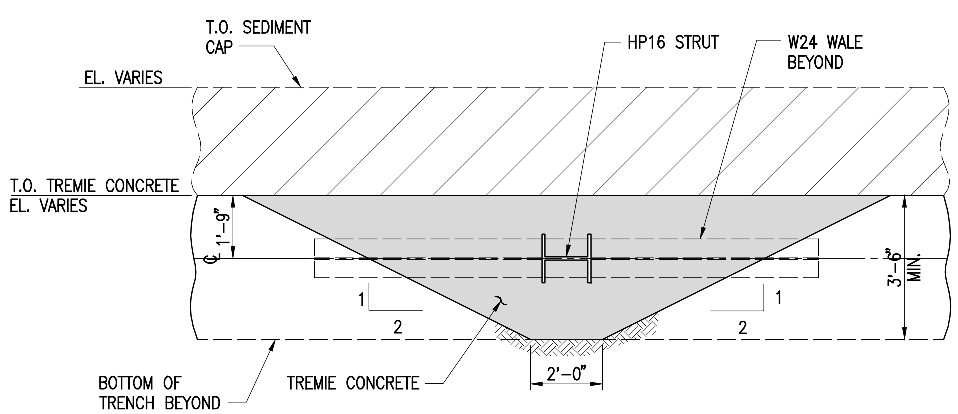
SECTION D
SCALE: 1/8"=1'-0" S-101|S-201



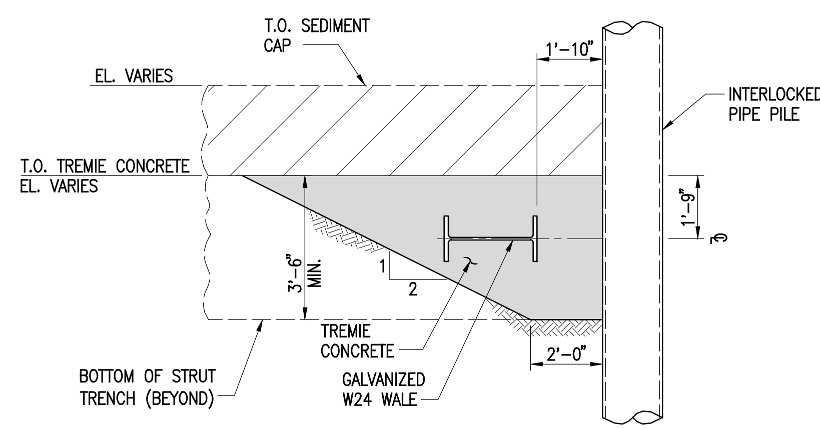
SECTION E
SCALE: 1/8"=1'-0" S-102|S-201



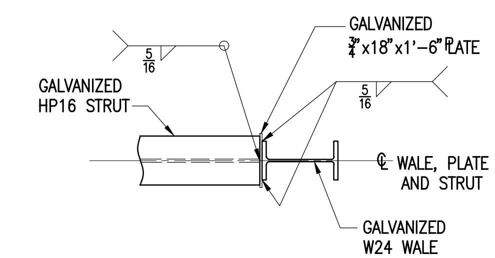
DETAIL 1
SCALE: 3/4"=1'-0" S-102|S-201



SECTION F
SCALE: 3/8"=1'-0" S-101,S-102|S-201



SECTION G
SCALE: 3/8"=1'-0" S-101|S-201 S-102



SECTION H
SCALE: 3/8"=1'-0" S-201|S-201

90% - SUBMISSION
01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD
SECTIONS AND DETAILS

PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

FIGURE
S-201.00

CITY: SAN RAFAEL_CA DIV/GROUP: ENVCAD DB: A. SANCHEZ
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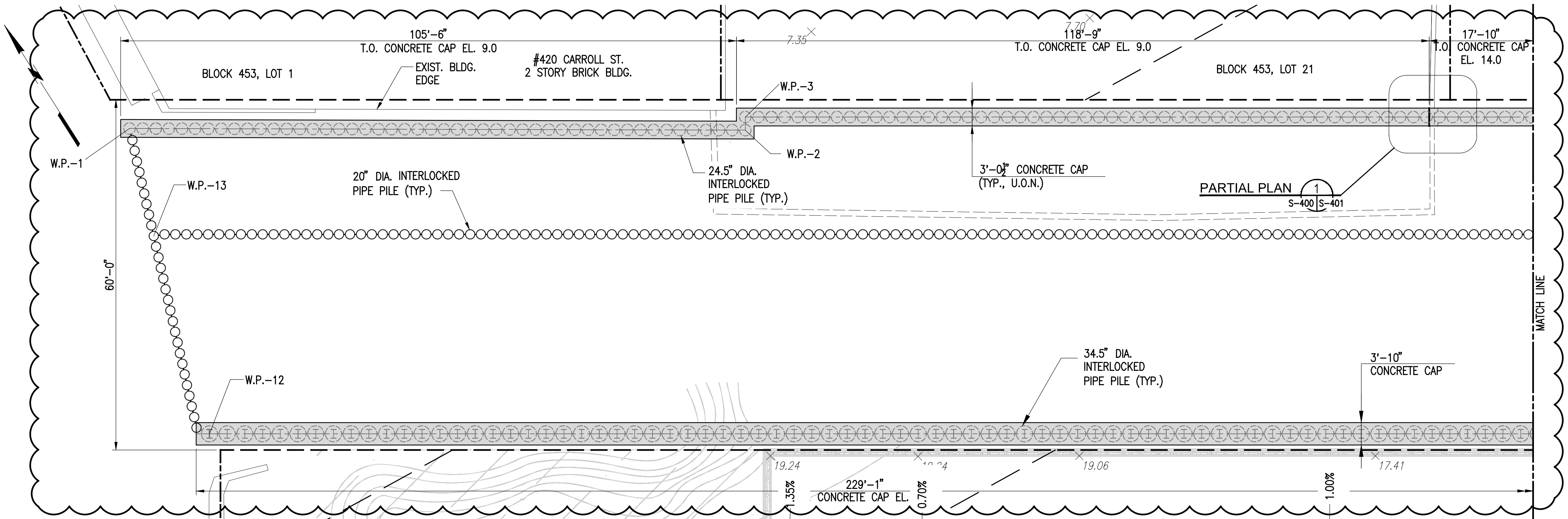
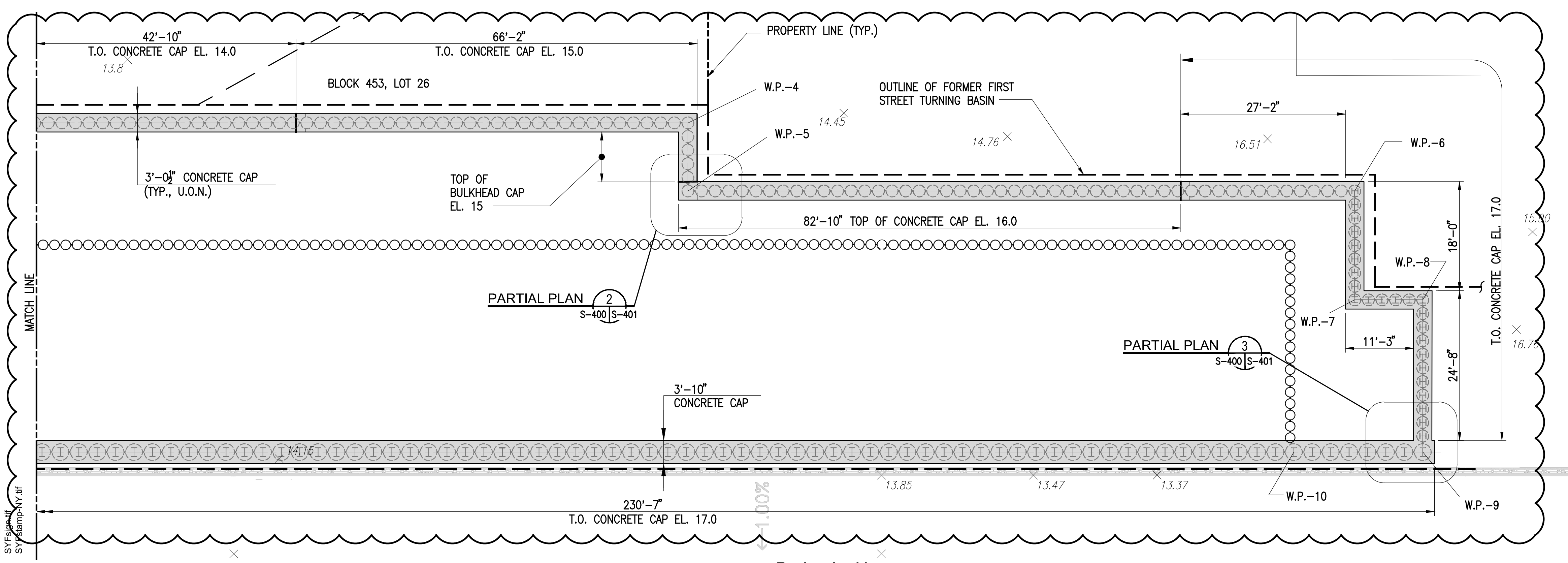


PLAN
SCALE: 3/32"=1'-0"



PLAN
SCALE: 3/32"=1'-0"

90% - SUBMISSION
01-03-2019

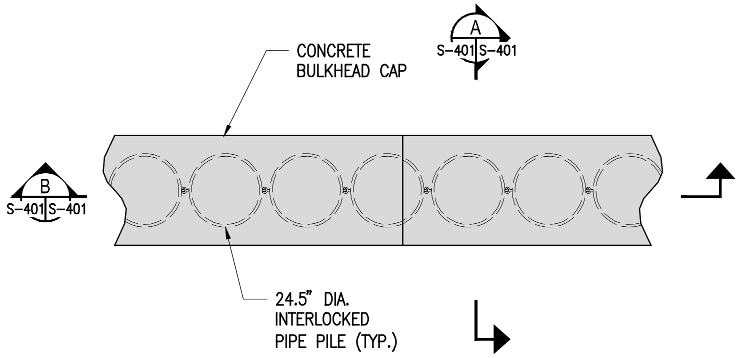
FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD CONCRETE CAP
PLAN

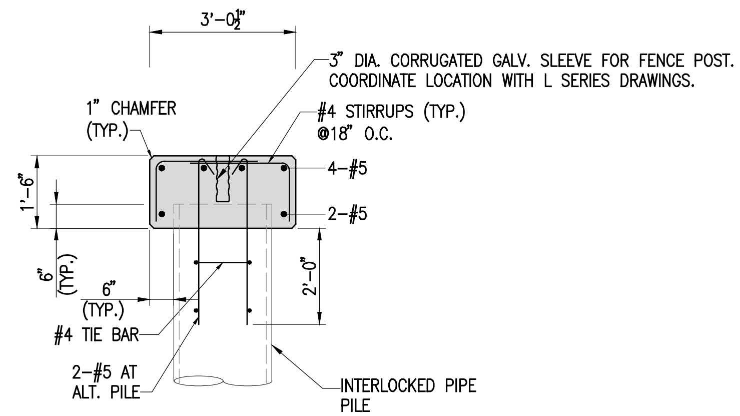
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF | KSE
The AKRF-KSE JV

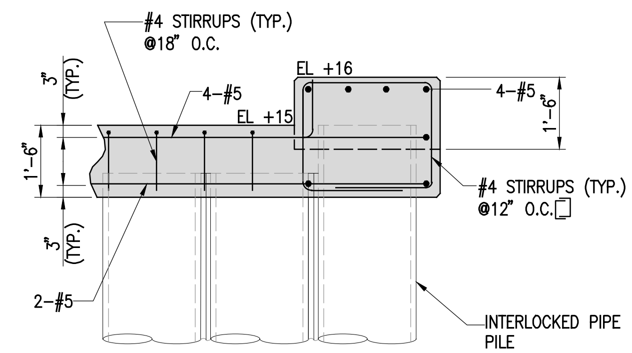
FIGURE
S-400.00



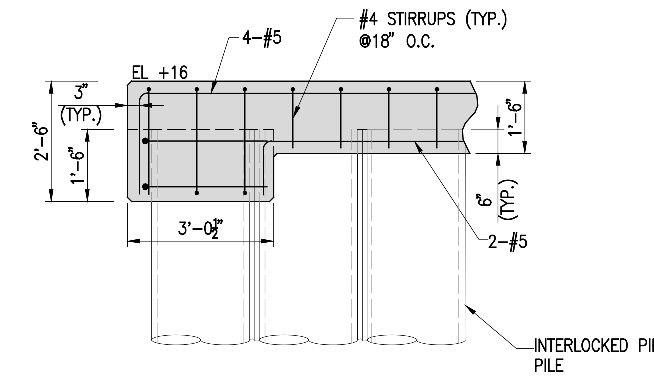
PARTIAL PLAN 1
SCALE: 3/8"=1'-0" S-400 S-401



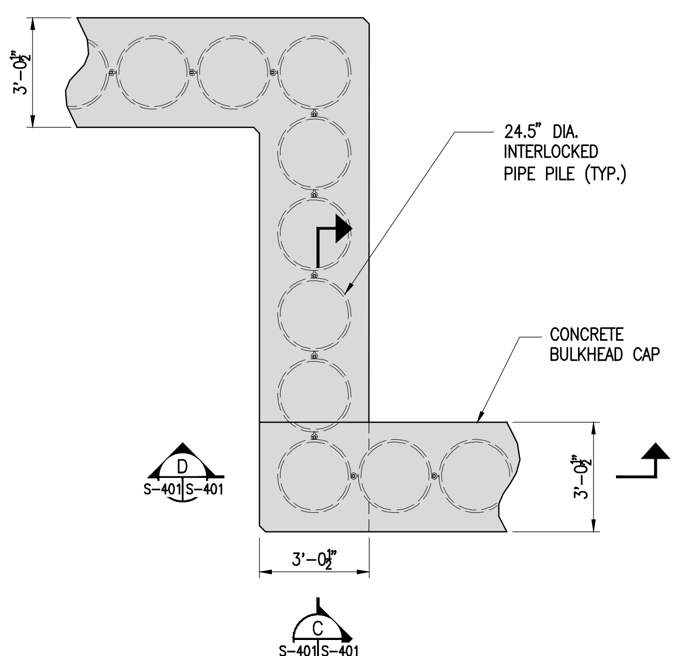
SECTION A
1/2"=1'-0" S-401 S-401



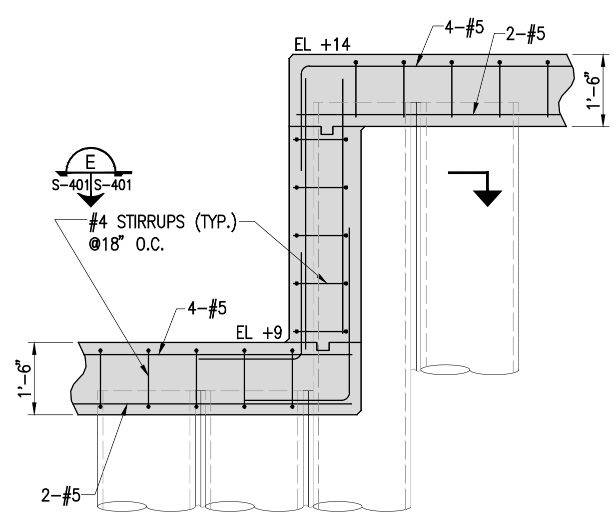
SECTION C
1/2"=1'-0" S-401 S-401



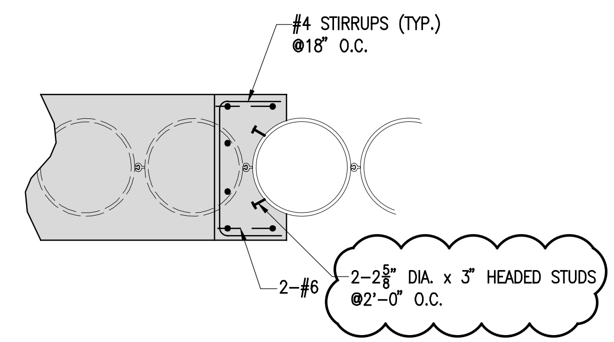
SECTION D
1/2"=1'-0" S-401 S-401



PARTIAL PLAN 2
SCALE: 3/8"=1'-0" S-400 S-401

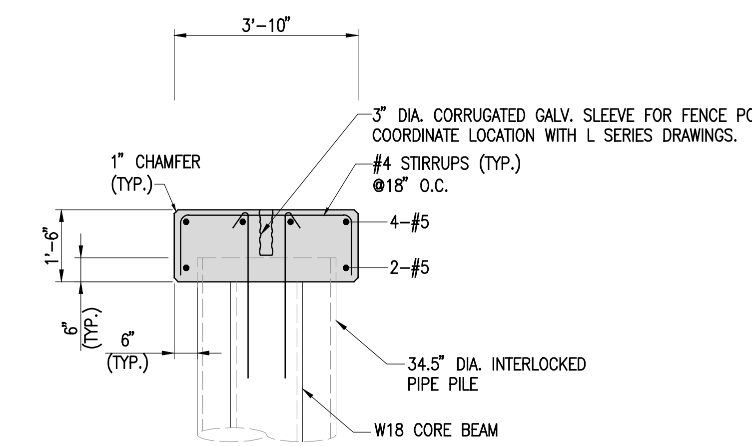


SECTION B
1/2"=1'-0" S-401 S-401

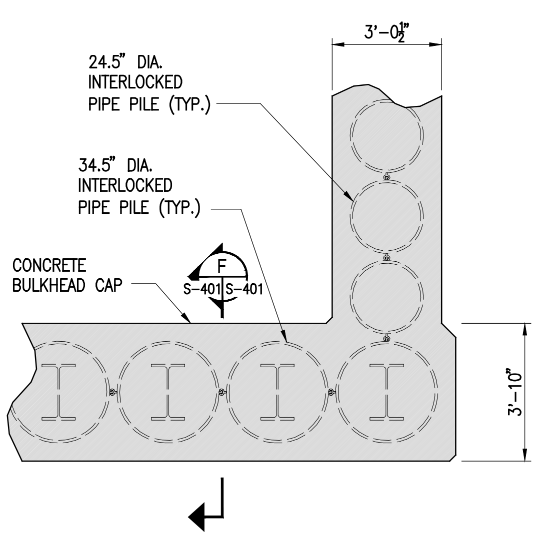


NOTE: PILE REINFORCEMENT NOT SHOWN.

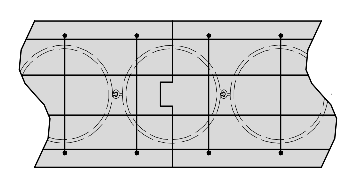
SECTION E
1/2"=1'-0" S-401 S-401



SECTION F
1/2"=1'-0" S-401 S-401



PARTIAL PLAN 3
SCALE: 3/8"=1'-0" S-400 S-401



TYPICAL CONSTRUCTION JOINT
SCALE: 1/2"=1'-0"

90% - SUBMISSION
01-03-2019

FIRST STREET TURNING BASIN - GOWANUS CANAL
BROOKLYN, NEW YORK

PERMANENT BULKHEAD CAP
PLANS, SECTIONS, AND DETAILS

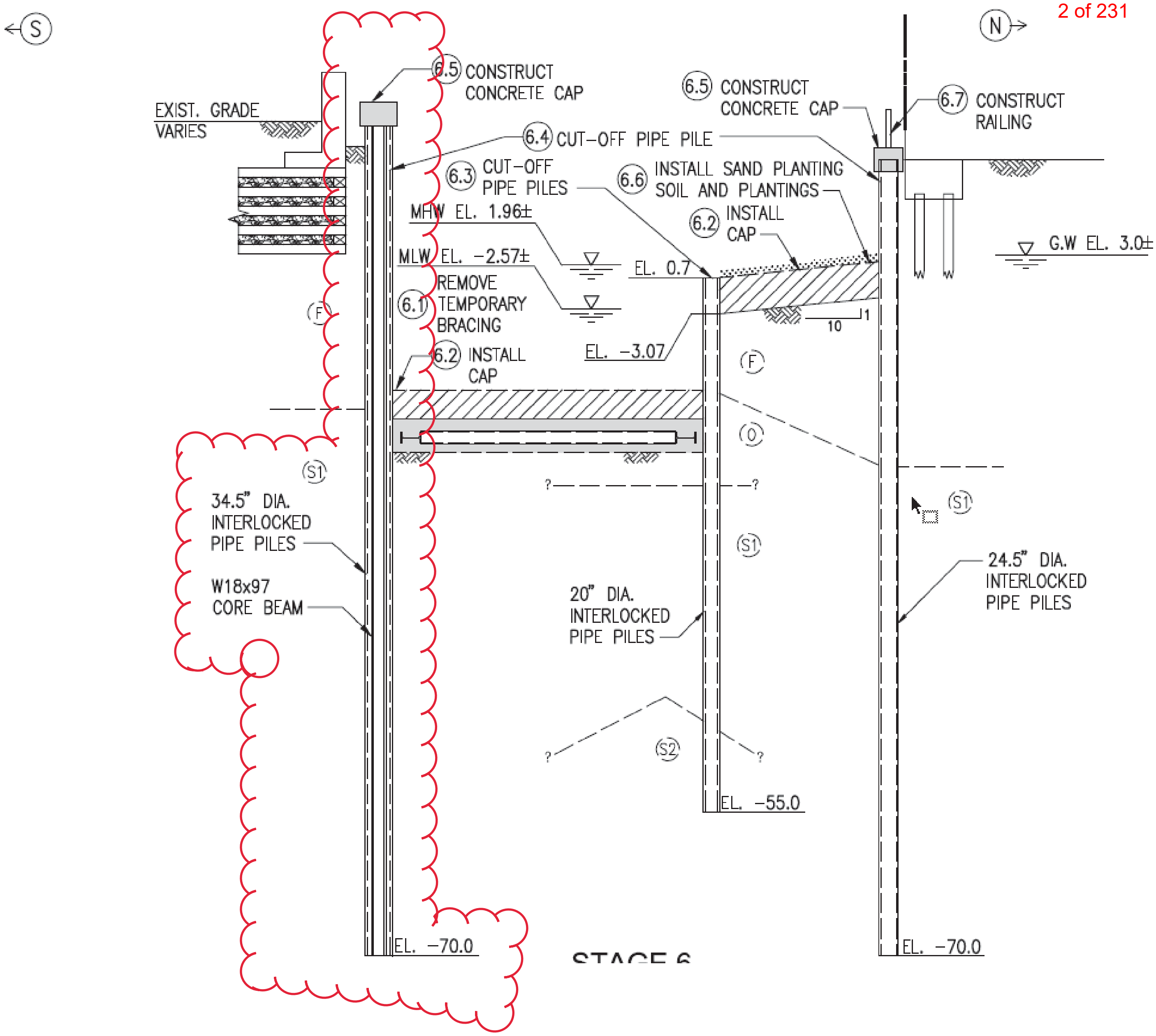
PREPARED BY: MUESER RUTLEDGE CONSULTING ENGINEERS, NY, NY

AKRF KSE
The AKRF-KSE JV

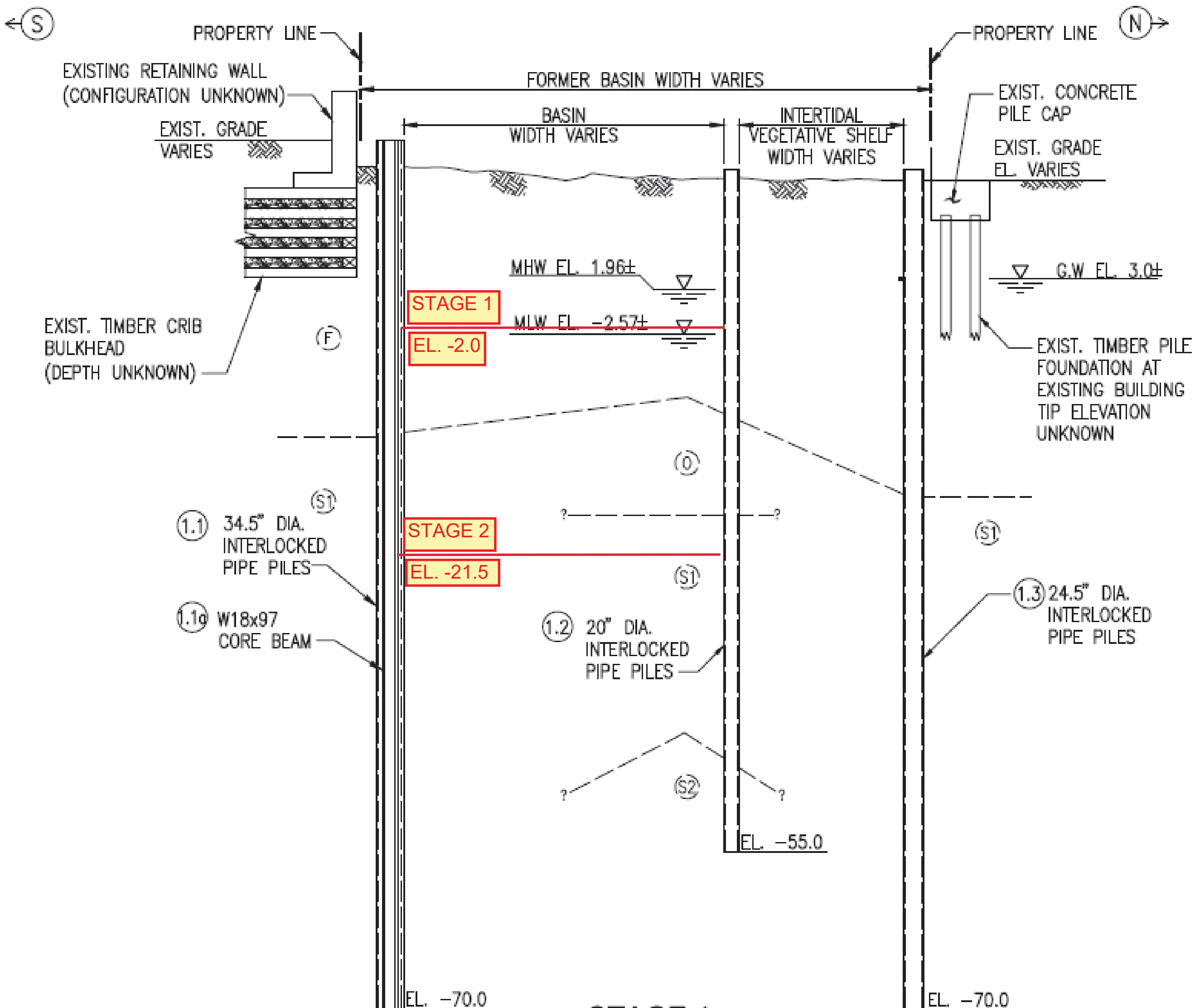
FIGURE
S-401.00

STAGING ANALYSIS AND BULKHEAD DESIGN

SOUTH BULKHEAD (34.5" DIA. INTERLOCKED PIPE PILE) ALONG POWER HOUSE PROP. LINE



34.5" DIA. INTERLOCKED PIPE PILE
PERMANENT CONDITION



STAGE 1

INSTALL INTERLOCKED PIPE PILES

SCALE: 3/32"=1'-0"

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 6/25/2018
Checked By: SL Date: 6/25/2018

FOR First Street Turning Basin

SUBJECT: EFFECTIVE STIFFNESS OF SECTION

south wall - 34" Pipe) 34.5" PIPE (CONSERVATIVE)

Pipe O.D	34	in
Pipe t	0.876	in
Pipe I.D	32.248	in
Geometry		
Corrosion Reduction	0.062	in
Pipe O.D	33.876	in
Pipe t	0.814	in
Moment of Inertia		
Pipe	11559	in^4
	4080	in^4/ft
Modulus of elasticity E		
Sheet Pile	29000	ksi

Core steel W18X97

Moment of Inertia	1750	in4
	618	in4/ft
E	29000	ksi

Concrete

Moment of Inertia	51336	in4
E	4000	ksi
n=	7.25	
Transformed I	7081	in4
	2499	in4/ft

Composite section

Moment of inertia	7197	in4/ft
S avail.	425	in3/ft
Effective Stiffness of Composite Section		
Eleff	208700029	k-in2/ft
	1449306	$k\text{-}ft^2/ft$

Sheet No. _______ of _______
File: 12541

MUESER RUTLEDGE CONSULTING ENGINEERS

Made By: TC Date: 1/2/2019
FOR First Street Turning Basin Checked By: SK Date: 1/2/2019

SUBJECT: **SOE STAGING SUMMARY : SOUTH RETAINING WALL (34.5" DIA. INTERLOCKED PIPE PILES ADJACENT TO POWERHOUSE SITE)**

TABLE 1

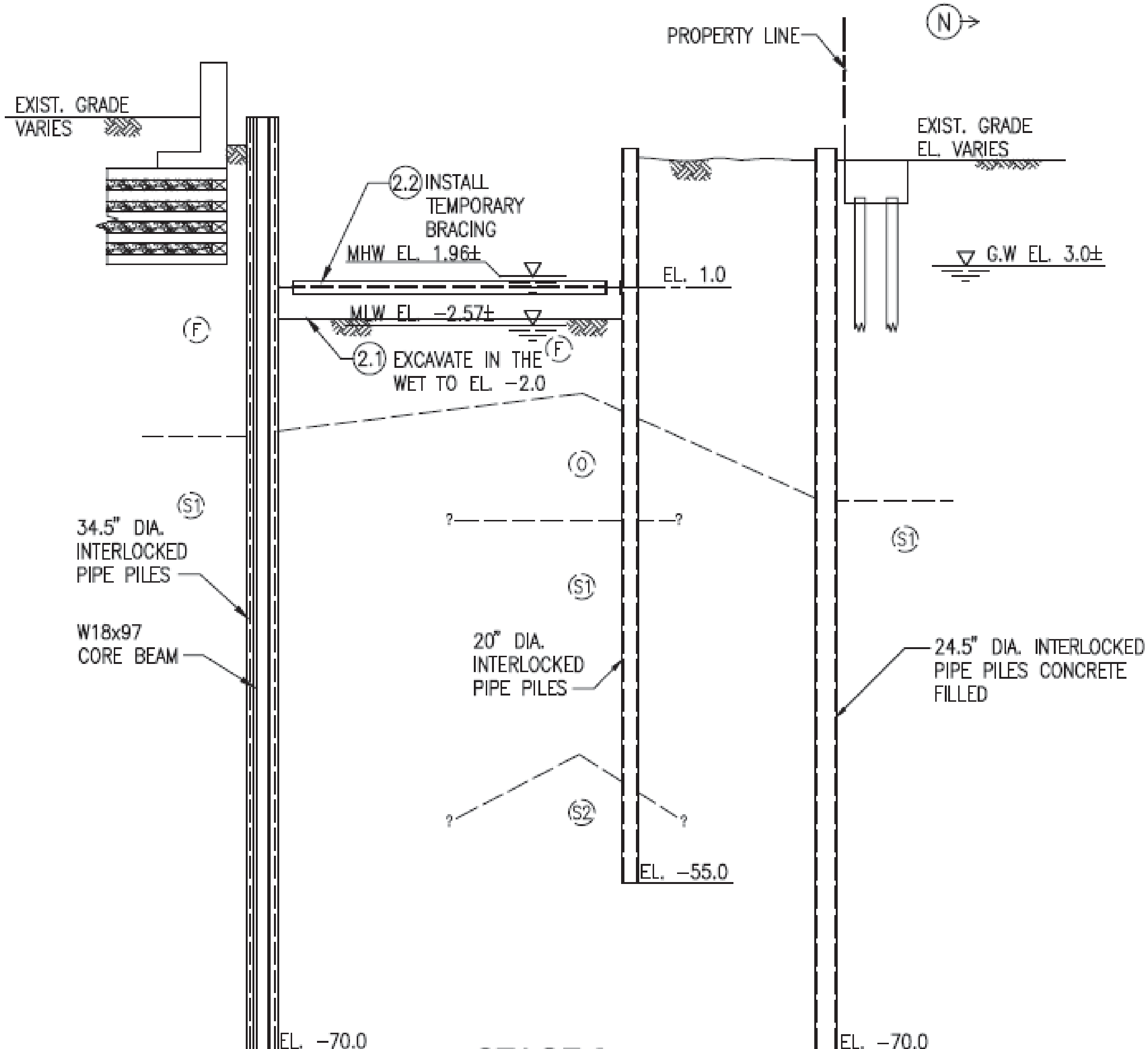
	SECTION / STAGE	Brace Reaction	Maximum Wall Moment	Maximum Wall Shear	Subgrade Elevation	Embedment Depth below Subgrade	Minimum Pile Tip Elevation	Max. Deflection	Notes
		-	M_{max}	V_{max}					
		k/ft	k*ft/ft	k/ft	El.	ft	El.	in	
Interlocked PipeSystem 34" O.D. x 0.876" w/ W18x97	**Stage 1** Excavate to EL. -2	--	259.2	45.3	-2.0	44.4	-46.4	1.7	600 psf construction surcharge
	Stage 2 Install brace at EL. +1 Excavate to El. -21.5	25.4	104.5	17.1	-21.5	18.3	-39.8	0.10	600 psf construction surcharge
	Stage 3 Install brace at EL. -18 Remove brace at EL. +1 Raise grade to EL. -16	34.2	448.8	34.2	-16.0	--	--	1.2	250 psf service surcharge
	Stage 4 Permanent case w/ liquefaction	119.8	1097.7	97.3	-16.0	54.7	-70.0	4.1	No surcharge

* At rest pressure used in stage 3. Active pressure used in all other stages.

*Maximum deflection in each stage occurs at top of wall.

SUBJECT: **SOE STAGING SUMMARY : SOUTH RETAINING WALL (34.5" DIA. INTERLOCKED PIPE PILES ADJACENT TO POWERHOUSE SITE)**

	Check			
	fy	50	ksi	
	Max M(Static)	448.8		
	Max M(Seismic)	1097.7		
Reqd S	M/0.6fy	179.52	in^3/ft	(Static)
	M/fy	263.44	in^3/ft	(Seismic)
	34" O.D. x 0.876" Pipe + W18x97			
	S available	425.0	in^3/ft	OK
	Stress (static)	12.7	ksi	
	Stress (seismic)	31.0	ksi	
	Shear area available	46	in^2	(core beam and conc. not included)
		16	in^2/ft	
Shear:	Max shear (static)	45.3	k/ft	
	Max shear (seismic)	97.3	k/ft	
Shear area reqd				
	allowable shear strength	20.0	ksi	(0.4Fy)
	Static	2.26	in^2/ft	
	Upper bound seismic	4.87	in^2/ft	OK



STAGE 1
EXCAVATETO EL. -2

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______

File: 12541

FOR First Street Turning Basin

Made By: TC Date: 11/7/2018

Checked By: SK Date: 11/7/2018

SUBJECT: CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE

Stage 1

Lateral Earth Pressures: Stage 1: Excavate to EL. -2. Refer to Section-B on SOE-300 and SOE-400.

DRIVING FORCES											RESISTING FORCES						
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	600psf Construction Surcharge [psf]	Water Pressure [psf]	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]
F	17	0	120	0	0.333		1.00	0	240	0							
	7	10	120	1200	0.333		1.00	400	240	0							
	7	0	120	1200	0.333		1.00	400	100	0							
	4	3	120	1560	0.333		1.00	520	100	0							
	4	0	120	1560	0.333		1.00	520	100	0							
	3	1	120	1680	0.333		1.00	560	100	62							
	3	0	57.6	1680	0.333		1.00	560	100	62							
	2	1	57.6	1738	0.333		1.00	579	100	125							
	2	0	57.6	1738	0.333		1.00	579	100	125							
	-2	4	57.6	1968	0.333		1.00	656	100	125							
	-2	0	57.6	1968	0.333		1.00	656	100	125	0	57.6	0	3.0	1.00		0
	-3	1	57.6	2026	0.333		1.00	675	100	125	1	57.6	58	3.0	1.00		-173
	-3	0	57.6	2026	0.333		1.00	675	0	125	0	57.6	58	3.00	1.00		-173
	-19	16	57.6	2947	0.333		1.00	982		125	16	57.6	979	3.00	1.00		-2938
S	-19	0	62.6	2947	0.307		1.00	906		125	0	62.6	979	3.25	1.00		-3187
	-21	2	62.6	3072	0.307		1.00	944		125	2	62.6	1104	3.25	1.00		-3594
	-21	0	62.6	3072	0.307		1.00	944		125	0	62.6	1104	3.25	1.00		-3594
	-30	9	62.6	3636	0.307		1.00	1117		125	9	62.6	1668	3.25	1.00		-5428

Net Pressure [psf]	Elev [ft]
240	17
640	7
500	7
620	4
620	4
722	3
722	3
804	2
804	2
881	-2
881	-2
727	-3
627	-3
-1830	-19
-2157	-19
-2526	-21
-2526	-21
-4186	-30

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

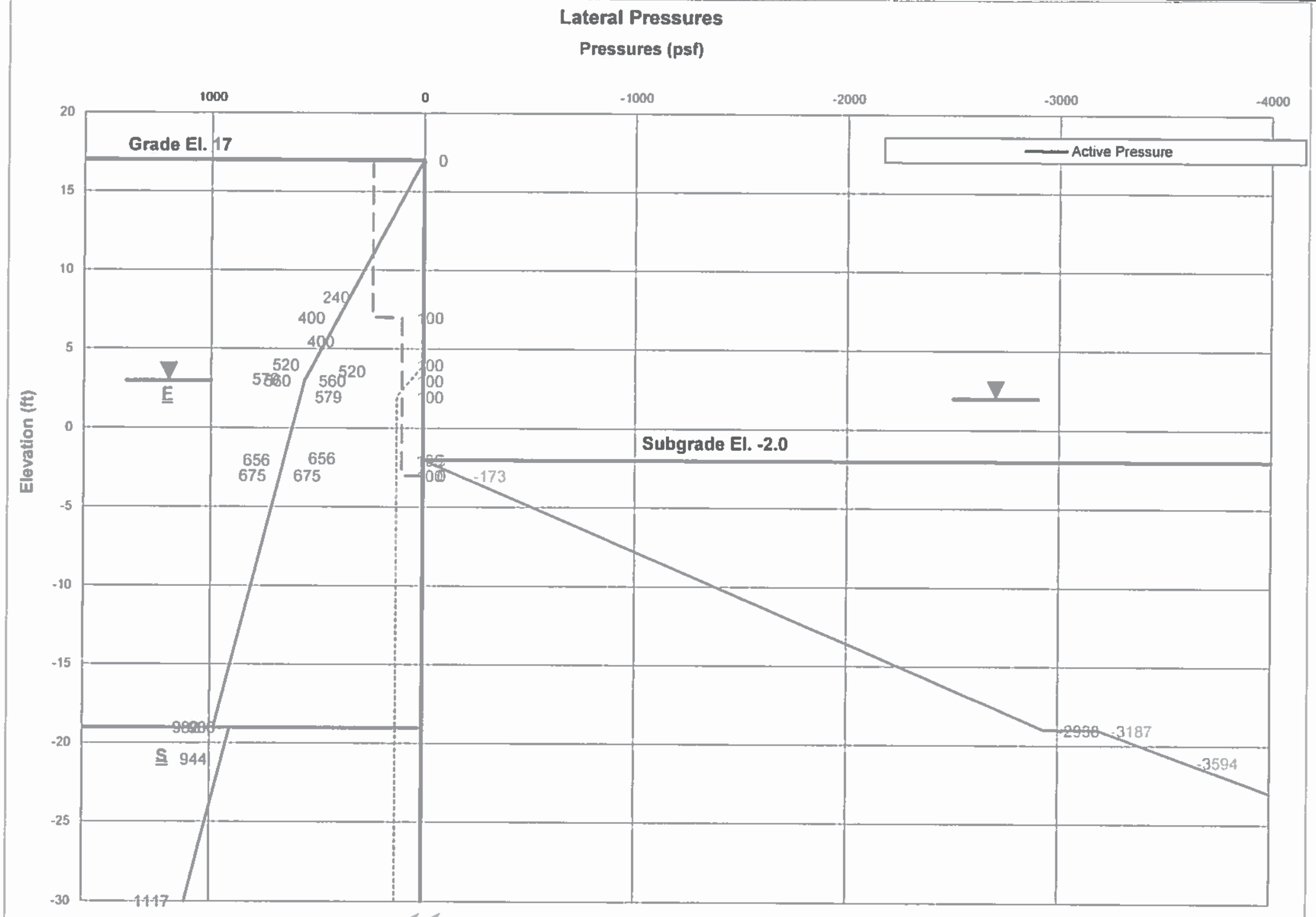
[1] Coefficient of active and passive earth pressure based on Rankine Theory.

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 1**



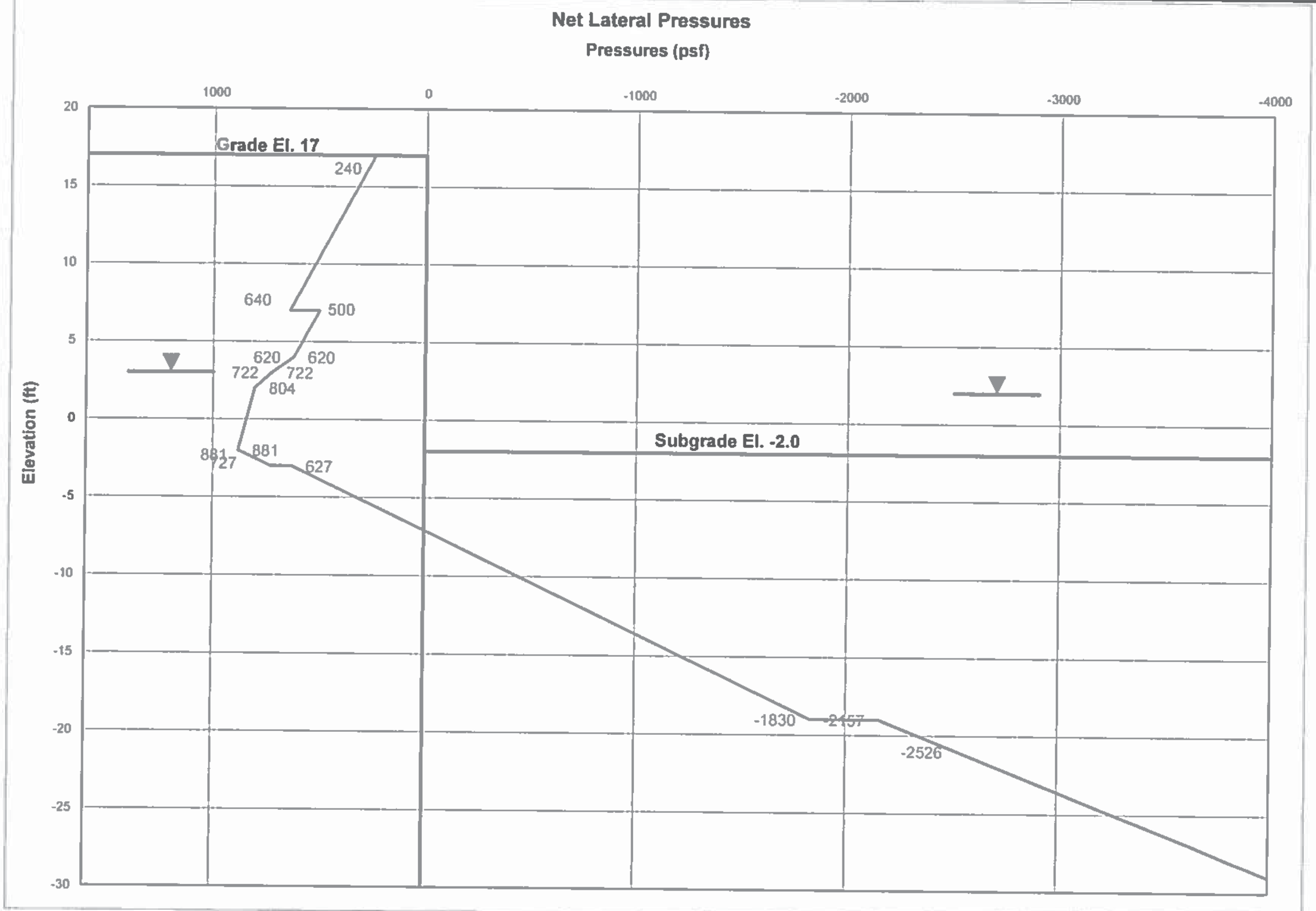
F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 1**



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Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

FOR First Street Turning Basin

Made By: TC Date: 11/7/2018

Checked By: SK Date: 11/12/2018

SUBJECT: **SOUTH RETAINING WALL: ANALYSIS SUMMARY - WET EXCAVATION** Stage 1

```
MUESER RUTLEDGE CONSULTING ENGINEERS

Cantilever v3.0 BETA for Windows, 32-bit
```

Subject: Stage 1: Excavate to EL. -2.0 Refer to Section-B on SOE-300 and SOE-400.

```
INPUT
-----

      P          Q        Interval
                          Lengths
   -------    -------    --------
    0.240      0.640      10.000
    0.500      0.620       3.000
    0.620      0.722       1.000
    0.722      0.804       1.000
    0.804      0.881       4.000
    0.881      0.727       1.000
    0.627     -1.830      16.000


Passive pressure at subgrade : 2.157
Passive pressure slope : .184
Flexural rigidity : 1449306

OUTPUT
------

At end of int. 1, Shear=   4.40, Moment=  18.67
At end of int. 2, Shear=   6.08, Moment=  34.30
At end of int. 3, Shear=   6.75, Moment=  40.70
At end of int. 4, Shear=   7.51, Moment=  47.83
At end of int. 5, Shear=  10.88, Moment=  84.52
At end of int. 6, Shear=  11.69, Moment=  95.82
At end of int. 7, Shear=   2.06, Moment= 258.25

D= 13.81 embedment below subgrade with F.S.= 1

Total Length of sheetpile is 49.81
```

Depth of embedment $= 1.2 \times 1.2 \times (13.81 + 17)$

$= 44.37$ ft

```
Depth of max. moment= 36.92
Max. moment= 259.22

Depth of max. shear= 49.81
Max. shear= 45.29
```

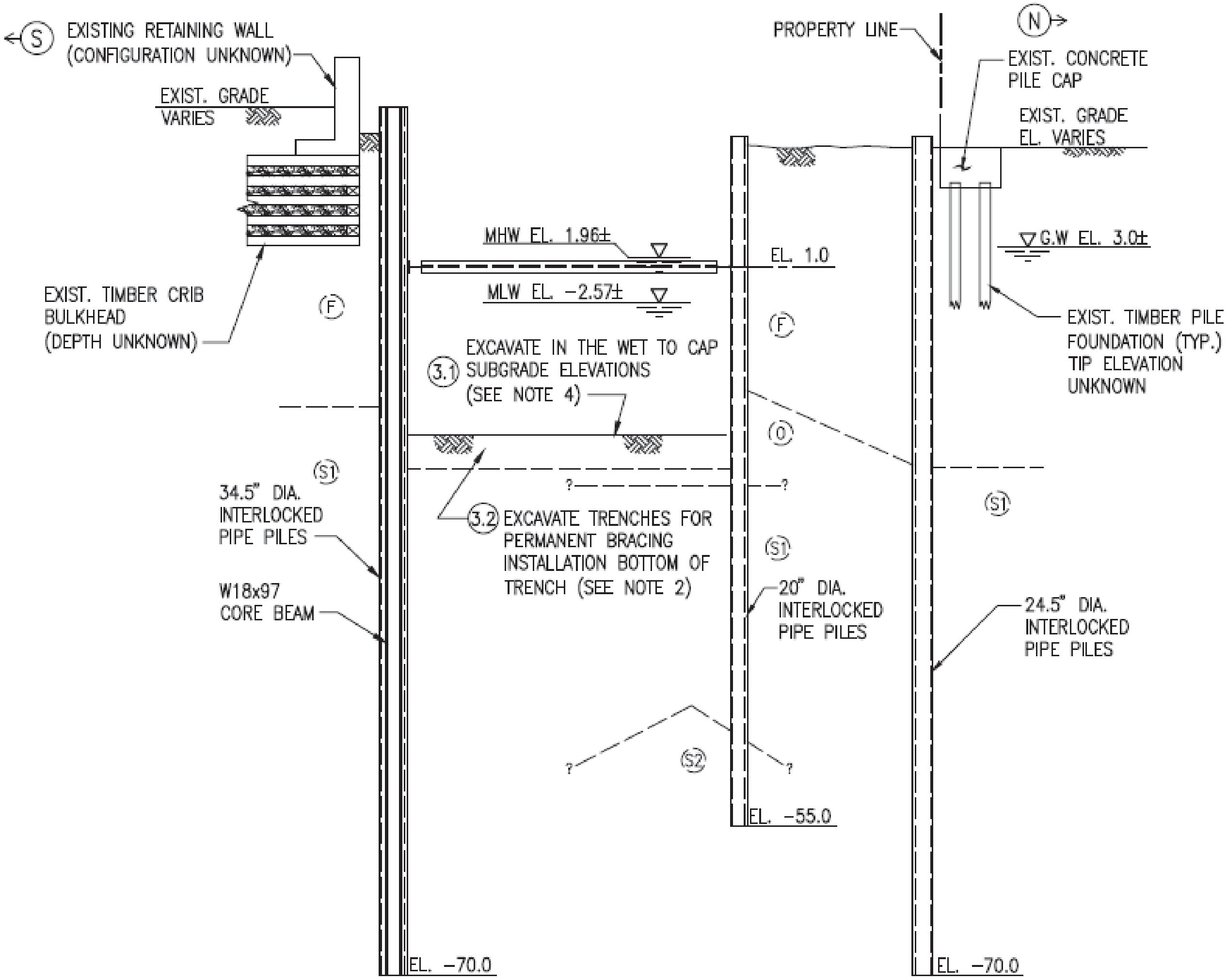
X	V	M	Defl.
0.00	0.00	0.00	0.14
2.49	0.72	0.85	0.13
4.98	1.69	3.80	0.12
7.47	2.91	9.48	0.11
9.96	4.38	18.50	0.10
12.45	5.75	31.06	0.09
14.94	7.47	47.41	0.08
17.43	9.53	68.55	0.07
19.93	11.63	94.95	0.06
22.42	12.75	125.53	0.05
24.91	12.92	157.70	0.04
27.40	12.12	189.08	0.03
29.89	10.38	217.30	0.02
32.38	7.68	240.00	0.02
34.87	4.03	254.79	0.01
37.36	-1.04	258.99	0.01
39.85	-7.61	248.46	0.00
42.34	-15.31	220.15	0.00
44.83	-24.16	171.22	0.00
47.32	-34.15	98.83	0.00
49.81	-45.29	0.14	0.00

Moment (M/Mmax)

```
   -1.0           -0.5            0.0           0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  2.5                              |:
  5.0                              |:
  7.5                              |:
 10.0                              | :
 12.5                              |   :
 14.9                              |    :
 17.4                              |       :
 19.9                              |          :
 22.4                              |              :
 24.9                              |                 :
 27.4                              |                     :
 29.9                              |                        :
 32.4                              |                           :
 34.9                              |                             :
 37.4                              |                             :
 39.9                              |                            :
 42.3                              |                        :
 44.8                              |                   :
 47.3                              |          :
 49.8                              |:
```

Shear (V/Vmax)

```
   -1.0           -0.5            0.0           0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  2.5                              |:
  5.0                              |:
  7.5                              | :
 10.0                              |  :
 12.5                              |   :
 14.9                              |    :
 17.4                              |     :
 19.9                              |       :
 22.4                              |       :
 24.9                              |        :
 27.4                              |       :
 29.9                              |      :
 32.4                              |    :
 34.9                              |  :
 37.4                             :|
 39.9                        :     |
 42.3                   :          |
 44.8             :                |
 47.3       :                      |
 49.8:                             |
```



STAGE 2
INSTALL BRACE AT EL. 1

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE **Stage 2**

Lateral Earth Pressures: Stage 2: Install Brace at EL. +1.0. Excavate to EL. -21.5. Refer to Section-B on SOE-300 and SOE-400.

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	600psf Construction Surcharge (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	17	0	120	0	0.333		1.00	0	240									240	17
	7	10	120	1200	0.333		1.00	400	240									640	7
	7	0	120	1200	0.333		1.00	400	100									500	7
	4	3	120	1560	0.333		1.00	520	100									620	4
	4	0	120	1560	0.333		1.00	520	100	0								620	4
	3	1	120	1680	0.333		1.00	560	100	62								722	3
	3	0	57.6	1680	0.333		1.00	560	100	62								722	3
	2	1	57.6	1738	0.333		1.00	579	100	125								804	2
	2	0	57.6	1738	0.333		1.00	579	100	125								804	2
	-3	5	57.6	2026	0.333		1.00	675	100	125								900	-3
	-3	0	57.6	2026	0.333		1.00	675	50	125								850	-3
	-18	15	57.6	2890	0.333		1.00	963	50	125								1138	-18
	-18	0	57.6	2890	0.333		1.00	963	0	125								1088	-18
	-19	1	57.6	2947	0.333		1.00	982		125								1107	-19
S	-19	0	62.6	2947	0.307		1.00	906		125								1030	-19
	-21.5	2.5	62.6	3104	0.307		1.00	954		125	0	62.6	0	3.25	1.00		0	1078	-21.5
	-21.5	0	62.6	3104	0.307		1.00	954		125	0	62.6	0	3.25	1.00		0	1078	-21.5
	-30	8.5	62.6	3636	0.307		1.00	1117		125	8.5	62.6	532	3.25	1.00		-1732	-490	-30

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

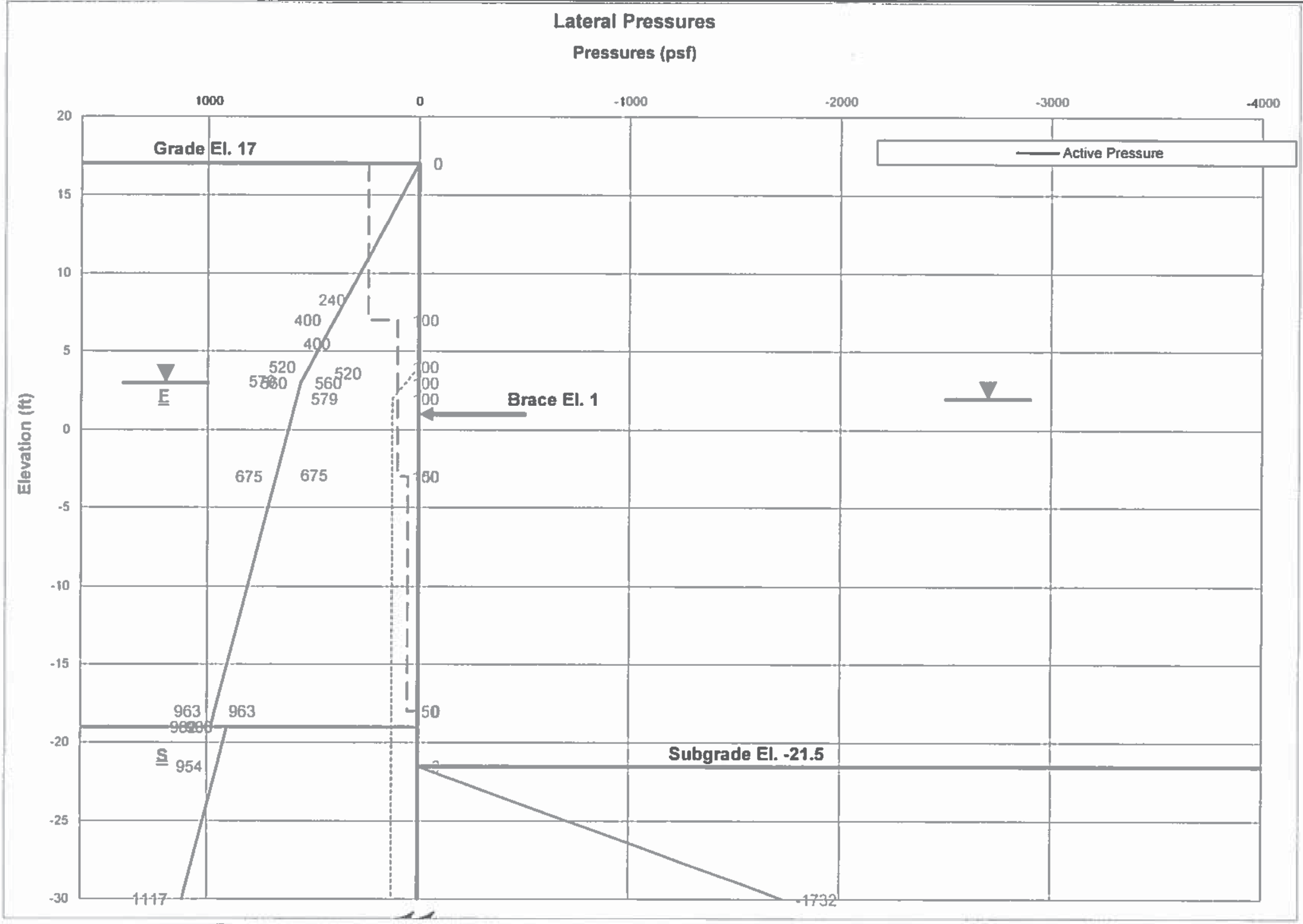
[1] Coefficient of active and passive earth pressure based on Rankine Theory.

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE Stage 2



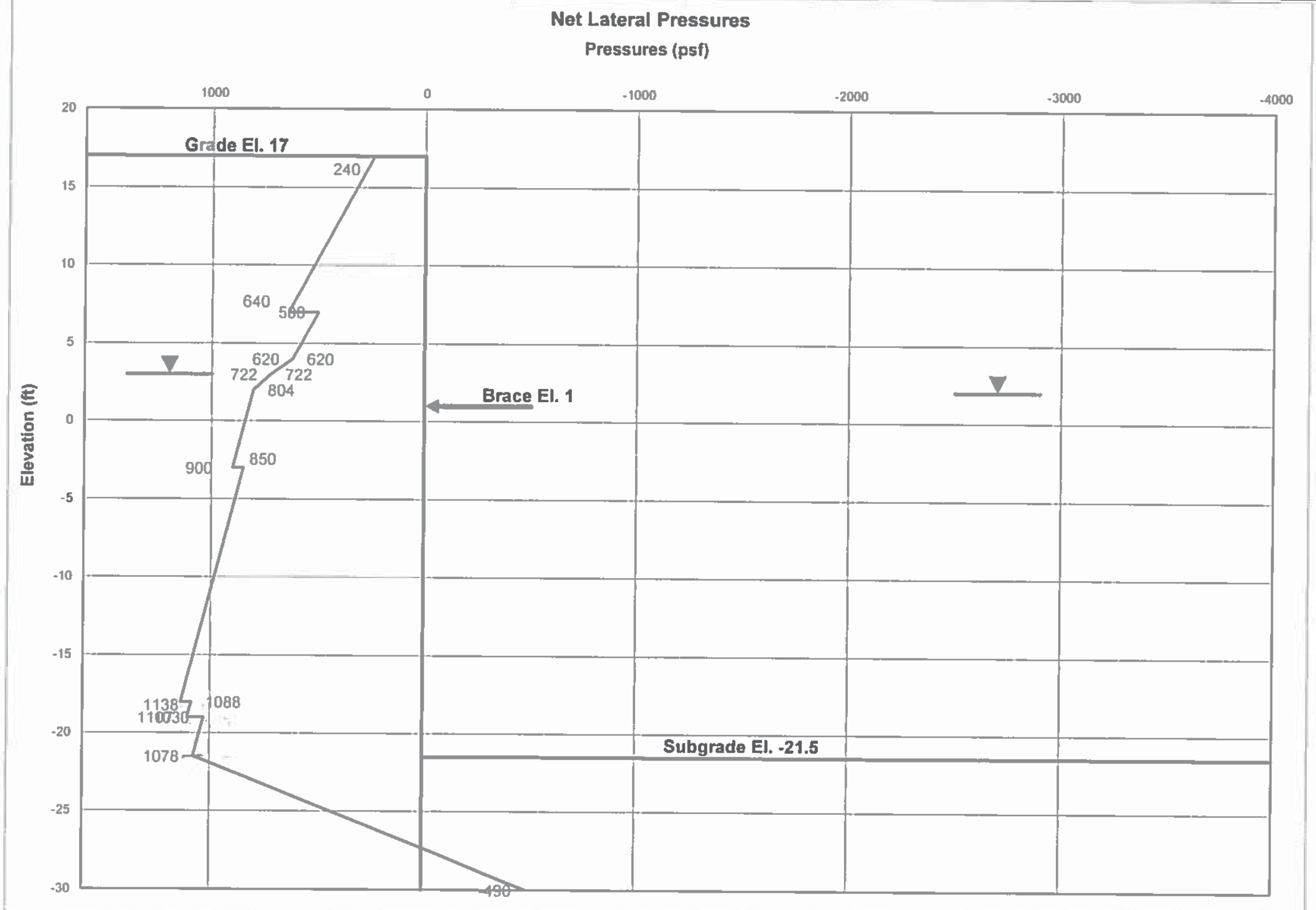
F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SR Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 2**



F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC | Date: 11/7/2018

FOR First Street Turning Basin

Checked By: SK | Date: 11/12/2018

SUBJECT: **SOUTH RETAINING WALL: ANALYSIS SUMMARY - WET EXCAVATION** Stage 2

MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows

Subject: Stage 2: Install brace at EL +1.0. Excavate to EL. -21.5. Refer to Section-B on SOE-300 and SOE-400.

FREE EARTH METHOD

For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.240	0.640	10.00
0.500	0.620	3.00
0.620	0.722	1.00
0.722	0.804	1.00
0.804	0.900	5.00
0.850	1.138	15.00
1.088	1.107	1.00
1.030	1.078	2.50

Pressure at slope (ksf): -1.078
Pressure slope (ksf/ft): 0.1845

Flexural rigidity of wall [EI] (k-ft^2): 1449306

Distance from top of wall to anchor (ft): 16

Results from analysis:

d = 15.25 ft embedment below z = 38.50
with FS=1.0

Depth of embedment = 1.2 × (15.25)
= 18.3 ft

Total wall length = 53.75 ft

Anchor Pull = 25.40 k/ft
Moment at anchor = 55.75 k-ft/ft
Shear at anchor = 17.08 k/ft

Maximum positive moment = 104.51 k-ft/ft

Maximum moment = 104.51 k-ft/ft
Location of maximum moment = 33.87 ft below top of wall

Maximum shear = 17.08 k/ft

Maximum load = -1.74 ksf/ft
Maximum defl. = -0.11 in at 34.94 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.24	0.00	0.00	0.10
2.69	0.35	0.79	-1.00	0.08
5.37	0.45	1.87	-4.50	0.07
8.06	0.56	3.23	-11.29	0.05

10.75	0.53	4.79	-22.11	0.04
13.44	0.66	6.36	-37.02	0.02
16.12	0.83	-16.97	-53.63	0.00
18.81	0.88	-14.69	-11.05	-0.02
21.50	0.88	-12.33	25.24	-0.05
24.19	0.93	-9.90	55.15	-0.07
26.87	0.98	-7.33	78.34	-0.09
29.56	1.03	-4.62	94.44	-0.10
32.25	1.09	-1.78	103.07	-0.11
34.94	1.14	1.21	103.87	-0.11
37.62	1.06	4.08	96.73	-0.11
40.31	0.74	6.66	82.08	-0.10
43.00	0.25	8.00	62.08	-0.08
45.69	-0.25	8.00	40.30	-0.07
48.37	-0.74	6.66	20.30	-0.04
51.06	-1.24	4.00	5.68	-0.02
53.75	-1.74	0.00	0.01	0.00

```
                          Pressure    (P/Pmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                          *   |
  2.7                        *     |
  5.4                      *       |
  8.1                    *         |
 10.7                     *        |
 13.4                   *          |
 16.1                *             |
 18.8               *              |
 21.5               *              |
 24.2              *               |
 26.9             *                |
 29.6            *                 |
 32.2           *                  |
 34.9          *                   |
 37.6            *                 |
 40.3                 *            |
 43.0                          *   |
 45.7                              |   *
 48.4                              |            *
 51.1                              |                    *
 53.7                              |                             *
```

```
                          Moment    (M/Mmax)

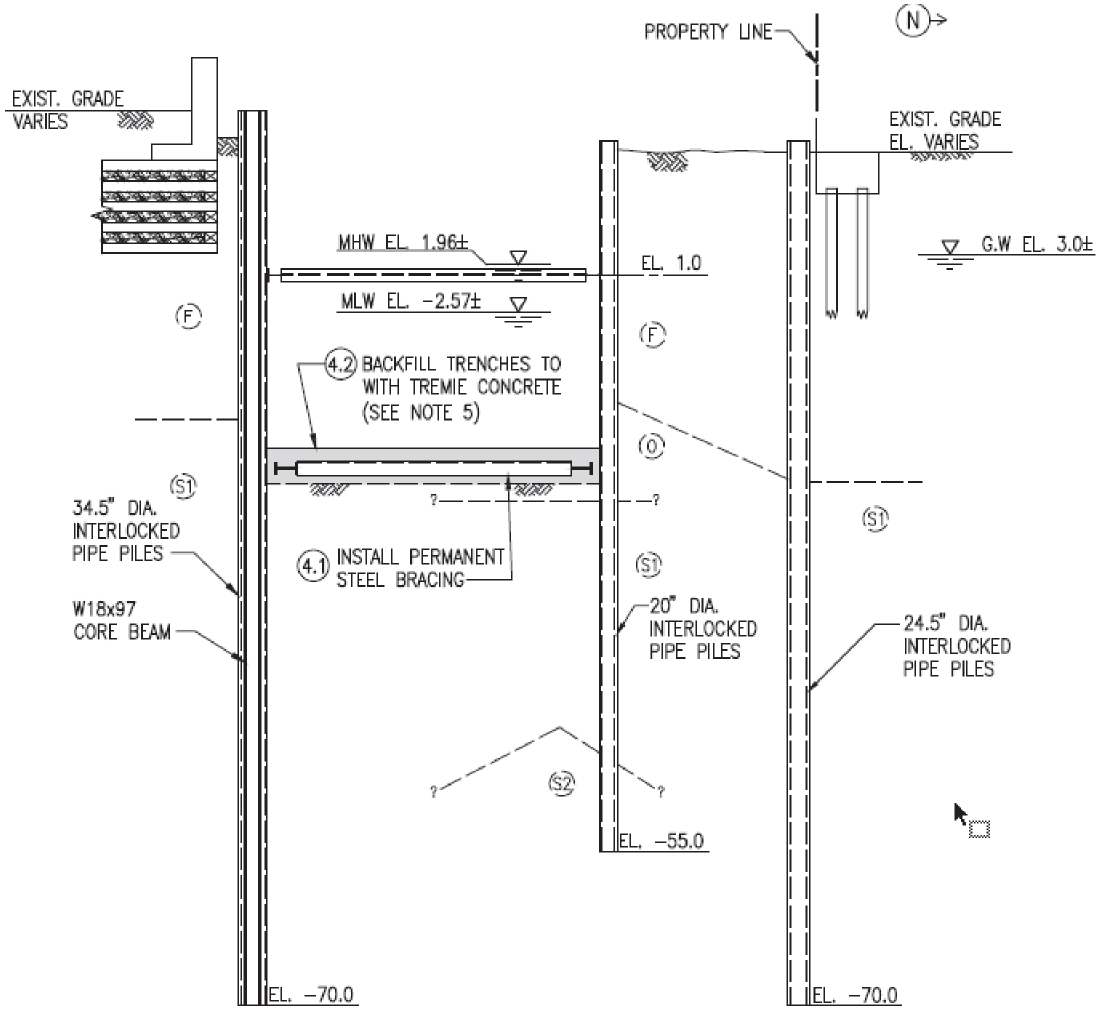
    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  2.7                              *
  5.4                             *|
  8.1                           *  |
 10.7                        *     |
 13.4                   *          |
 16.1               *              |
 18.8                           *  |
 21.5                              |      *
 24.2                              |               *
 26.9                              |                     *
 29.6                              |                          *
 32.2                              |                             *
 34.9                              |                             *
 37.6                              |                           *
 40.3                              |                       *
 43.0                              |                 *
 45.7                              |           *
```

```
 48.4                              |     *
 51.1                              | *
 53.7                              *

                           Shear     (V/Vmax)

    1.0            0.5            0.0           -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  2.7                              |*
  5.4                              |  *
  8.1                              |     *
 10.7                              |       *
 13.4                              |          *
 16.1*                             |
 18.8    *                         |
 21.5        *                     |
 24.2             *                |
 26.9                 *            |
 29.6                      *       |
 32.2                           *  |
 34.9                              | *
 37.6                              |      *
 40.3                              |           *
 43.0                              |             *
 45.7                              |             *
 48.4                              |           *
 51.1                              |      *
 53.7                              *
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0           -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0   *                          |
  2.7        *                     |
  5.4            *                 |
  8.1                *             |
 10.7                    *         |
 13.4                         *    |
 16.1                              *
 18.8                              |     *
 21.5                              |           *
 24.2                              |                 *
 26.9                              |                     *
 29.6                              |                         *
 32.2                              |                           *
 34.9                              |                            *
 37.6                              |                           *
 40.3                              |                        *
 43.0                              |                    *
 45.7                              |                *
 48.4                              |           *
 51.1                              |     *
 53.7                              *
```



STAGE 3 & 4
EXCAVATE TO FINAL SUBGRADE
AND INSTALL PERMANENT BRACING

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 3**

Lateral Earth Pressures: Stage 3: Install permanent bracing after excavating to final subgrade. Refer to Section-B on SOE-300 and SOE-400

DRIVING FORCES											RESISTING FORCES						
Layer [1]	Elev (ft)	H (ft)	γ (pcf)	σ_v (psf)	k0	c (psf)	R_a	Active Pressure (psf)	250psf Service Surcharge (psf)	Water Pressure (psf)	H (ft)	γ (pcf)	σ_v (psf)	k_p	R_p (psf)	c (psf)	Passive Pressure (psf)
F	17	0	120	0	0.500		1.00	0	100	0							
	7	10	120	1200	0.500		1.00	600	100	0							
	7	0	120	1200	0.500		1.00	600	42	0							
	4	3	120	1560	0.500		1.00	780	42	0							
	4	0	120	1560	0.500		1.00	780	42	0							
	3	1	120	1680	0.500		1.00	840	42	62							
	3	0	57.6	1680	0.500		1.00	840	42	62							
	2	1	57.6	1738	0.500		1.00	869	42	125							
	2	0	57.6	1738	0.500		1.00	869	42	125							
	-3	5	57.6	2026	0.500		1.00	1013	42	125							
	-3	0	57.6	2026	0.500		1.00	1013	21	125							
	-11	8	57.6	2486	0.500		1.00	1243	21	125							
	-11	0	57.6	2486	0.500		1.00	1243	21	125							
	-18	7	57.6	2890	0.500		1.00	1445	21	125							
	-18	0	57.6	2890	0.500		1.00	1445		125							
	-19	1	57.6	2947	0.500		1.00	1474		125							
S	-19	0	62.6	2947	0.470		1.00	1385		125							
	-21.5	2.5	62.6	3104	0.470		1.00	1459		125							
	-21.5	0	62.6	3104	0.470		1.00	1459		125	0	62.6	0	3.25	1.00		0
	-50	28.5	62.6	4888	0.470		1.00	2298		125	28.5	62.6	1784	3.25	1.00		-5807

Net Pressure (psf)	Elev (ft)
100	17
700	7
642	7
822	4
822	4
944	3
944	3
1035	2
1035	2
1179	-3
1158	-3
1389	-11
1389	-11
1591	-18
1570	-18
1598	-19
1510	-19
1584	-21.5
1584	-21.5
-3384	-50

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of passive earth pressure based on Rankine Theory.

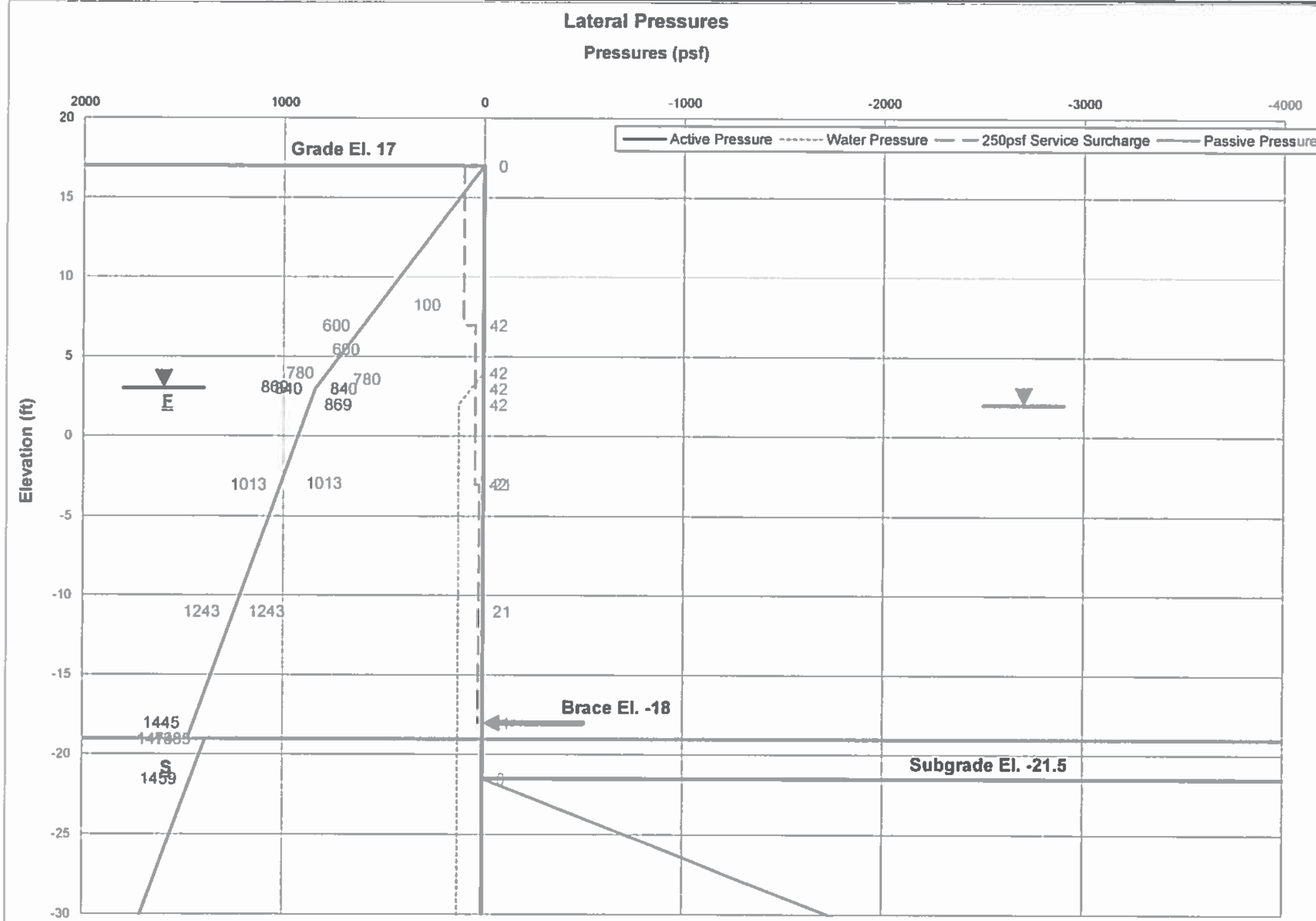
[2] At rest pressure is used in service condition.

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE Stage 3



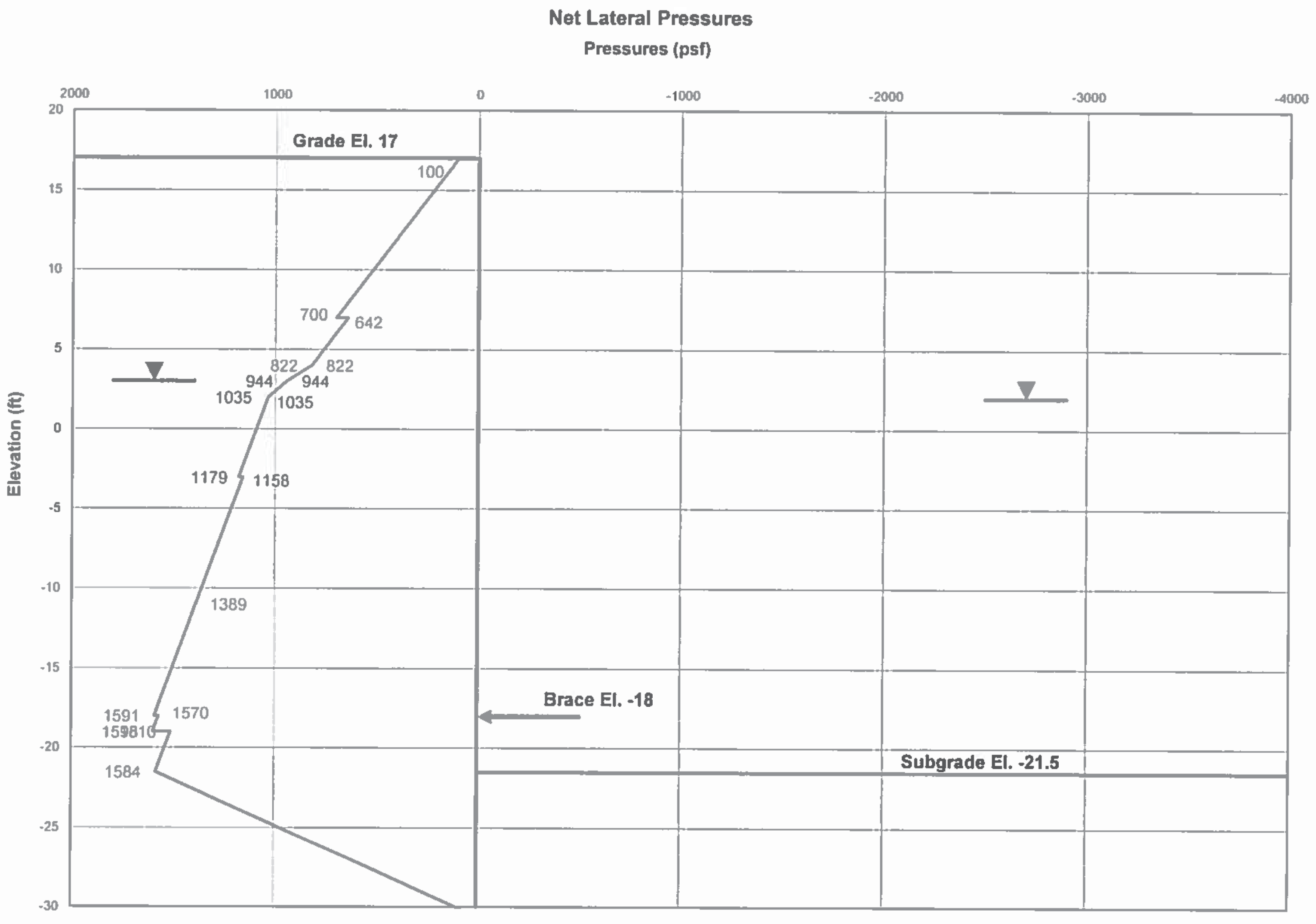
F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/7/2018
Checked By: SK Date: 11/7/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 3**



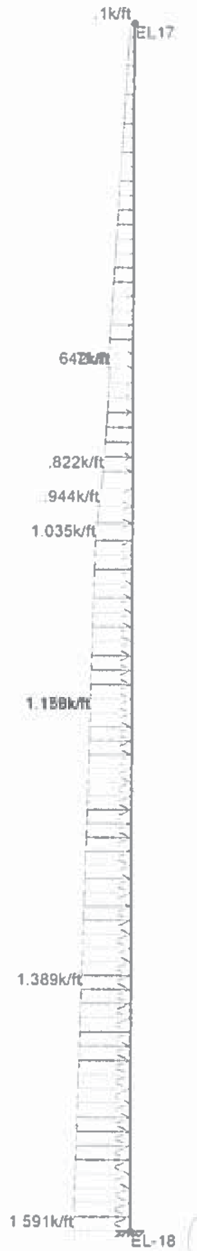
F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

Made by: TC
11/07/18

CHECKED
SK 11/7/18

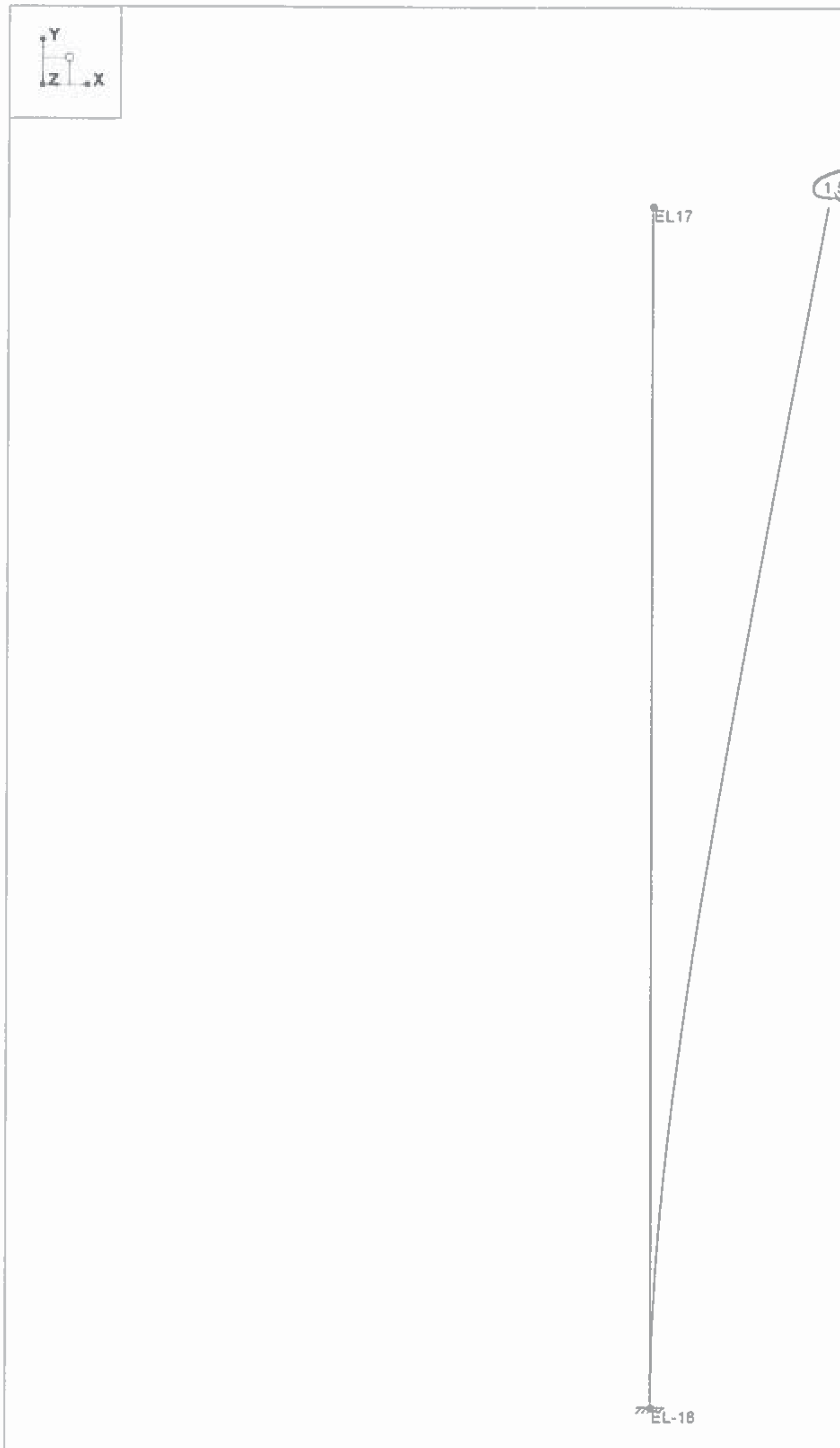
Stage 3: Install permanent bracing after excavating to final subgrade. Refer to Section-B on SOE-300 and SOE-400.

Y
Z X



Loads BLC 1, Earth Pressure 1

MRCE		SK - 1 1
TC	stage 3	Nov 7, 2018 at 12:02 PM
12541	pressure	5. Stage 3.r2d



$1.544\text{in} \times \frac{5685}{7197} = 1.22 \text{ in}$

NOTE:

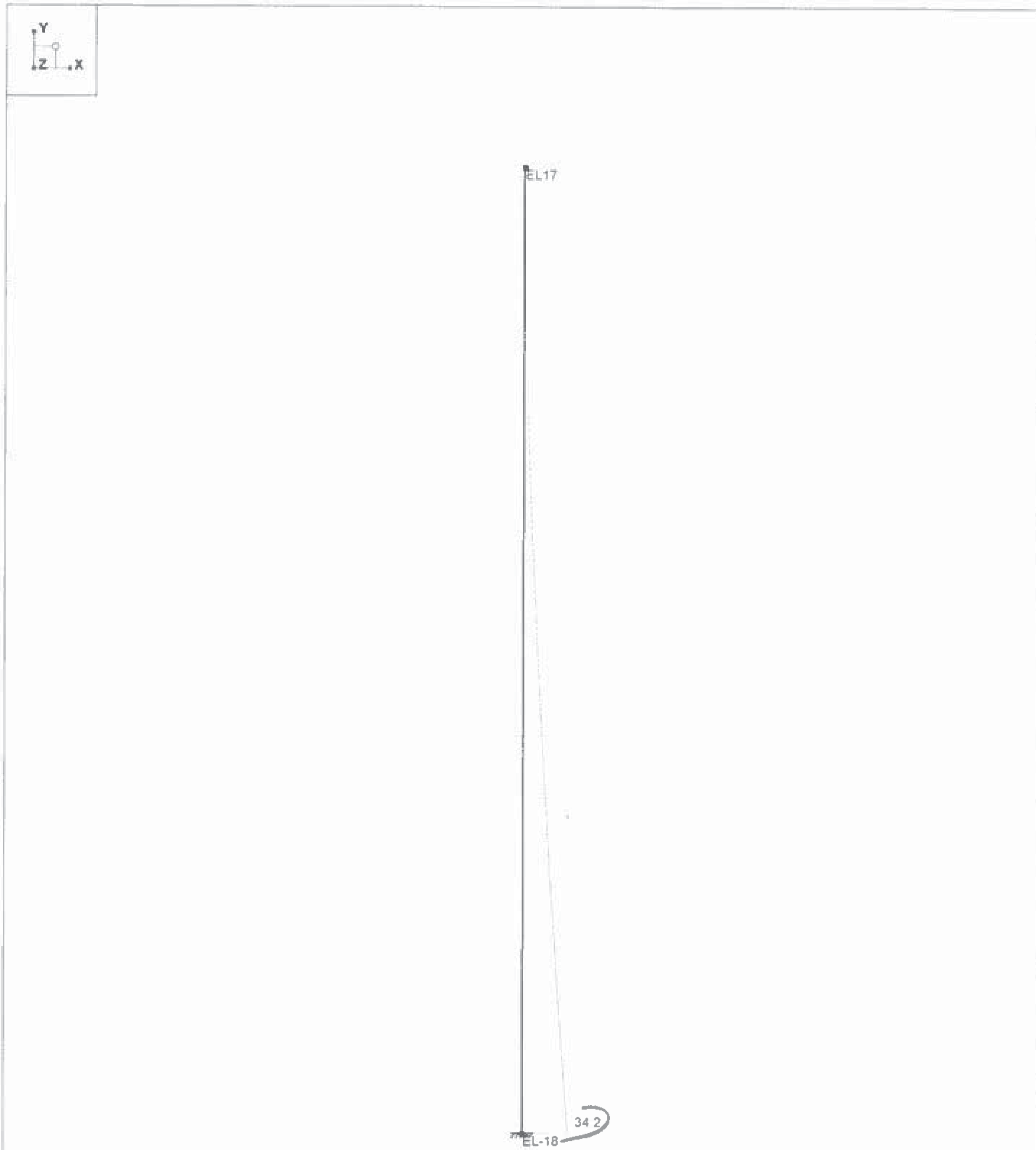
Moment of Inertia in RISA MODEL is 5685 in^4 while the actual Moment of Inertia is 7197 in^4

Results for LC 1,

MRCE		SK - 4 4
TC	stage 3	Nov 7, 2018 at 12:04 PM
12541	Deflection	5. Stage 3.r2d

Results for LC 1,
Member Bending Moments (k-ft)

MRCE	stage 3	SK - 3 3
TC		Nov 7, 2018 at 12:03 PM
12541	Moment	5. Stage 3.r2d



Results for LC 1,
Member Shear Forces (k)

MRCE	stage 3	SK - 2 2
TC		Nov 7, 2018 at 12:03 PM
12541	Shear	5. Stage 3.r2d

Sheet No. ______ of ______
File: 12541

MUESER RUTLEDGE CONSULTING ENGINEERS

Made By: TC Date: 11/8/2018
Checked By: SK Date: 11/8/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 4**

Lateral Earth Pressures: For Anchwall Analysis Bottom of liquifiable layer @ El -60 Stage 4: Liquefaction case: Refer to Section-B on SOE-300 and SOE-400

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	ka	c [psf]	R_a	Active Pressure [psf]	Surcharge (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	17	0	120	0	0.333		1.00	0		0								0	17
	9	8	120	960	0.333		1.00	320		0								320	9
	9	0	120	960	0.333		1.00	320		0								320	9
	4	5	120	1560	0.333		1.00	520		0								520	4
	4	0	120	1560	0.333		1.00	520		0								520	4
	3	1	120	1680	0.333		1.00	560		62								622	3
	3	0	57.6	1680	0.333		1.00	560		62								622	3
	2	1	57.6	1738	0.333		1.00	579		125								704	2
	2	0	57.6	1738	0.333		1.00	579		125								704	2
	-1	3	57.6	1910	0.333		1.00	637		125								762	-1
	-1	0	57.6	1910	0.333		1.00	637		125								762	-1
	-11	10	57.6	2486	0.333		1.00	829		125								954	-11
	-11	0	57.6	2486	0.333		1.00	829		125								954	-11
	-18	7	57.6	2890	0.333		1.00	963		125								1088	-18
	-18	0	57.6	2890	0.333		1.00	963		125	0	57.6	0	0.00	1.00		0	1088	-18
	-19	1	57.6	2947	0.333		1.00	982		125	1	57.6	58	0.00	1.00		0	1107	-19
S	-19	0	62.6	2947	1.000		1.00	2947		125	0	62.6	58	0.00	1.00		0	3072	-19
	-21	2	62.6	3072	1.000		1.00	3072		125	2	62.6	183	0.00	1.00		0	3197	-21
	-21	0	62.6	3072	1.000		1.00	3072		125	0	62.6	183	0.00	1.00		0	3197	-21
	-60	39	62.6	5514	1.000		1.00	5514		125	39	62.6	2624	0.00	1.00		0	5639	-60
	-60	0	62.6	5514	0.307		1.00	1694		125	0	62.6	2624	3.25	1.00		-8541	-6722	-60
	-70	10	62.6	6140	0.307		1.00	1887		125	10	62.6	3250	3.25	1.00		-10578	-8567	-70

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Liquefaction case - Ka =1 & Kp = 0

[2] Liquefaction only upto EL. -60

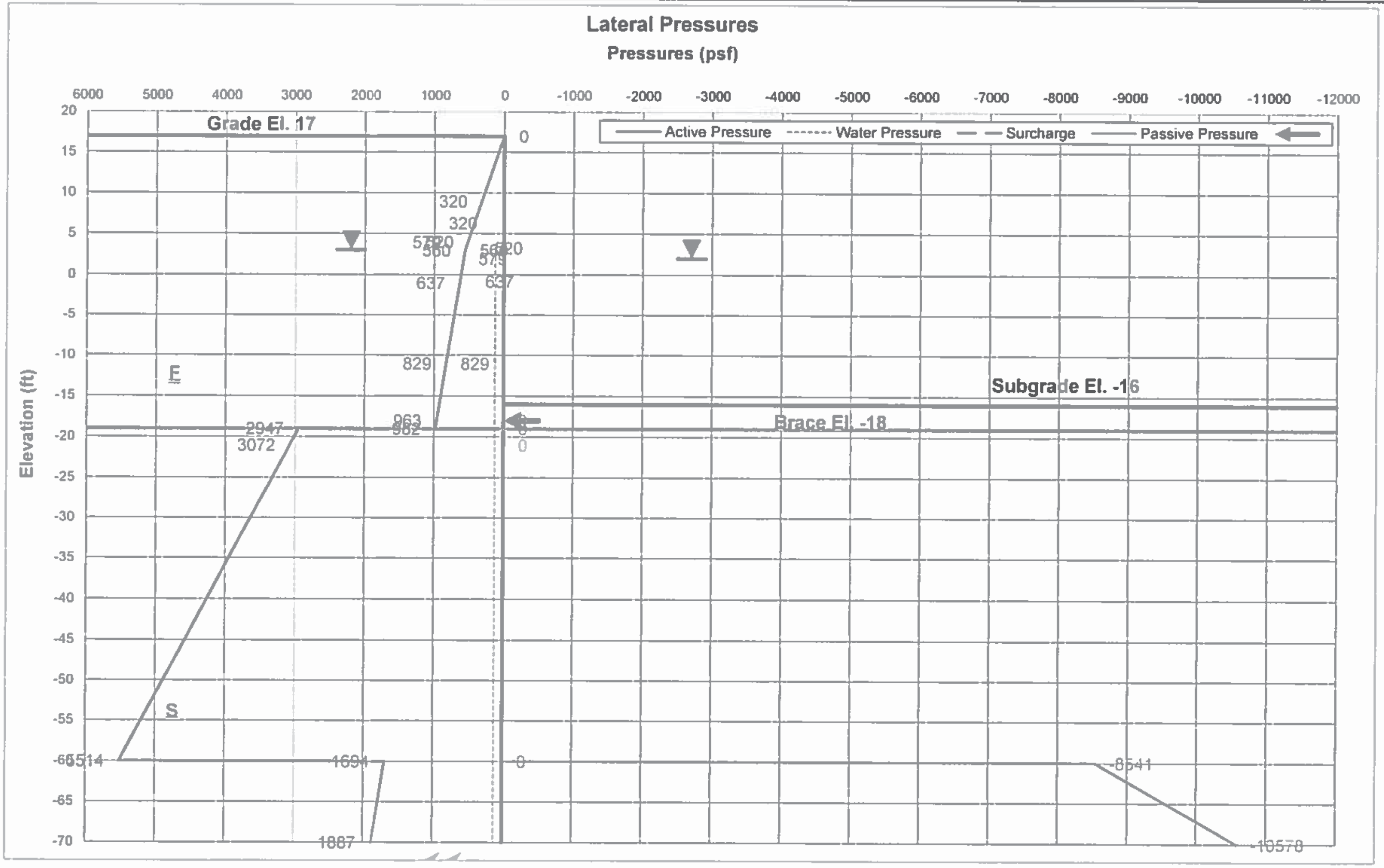
F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 11/8/2018
Checked By: SK Date: 11/8/2018

FOR First Street Turning Basin

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 4**



F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

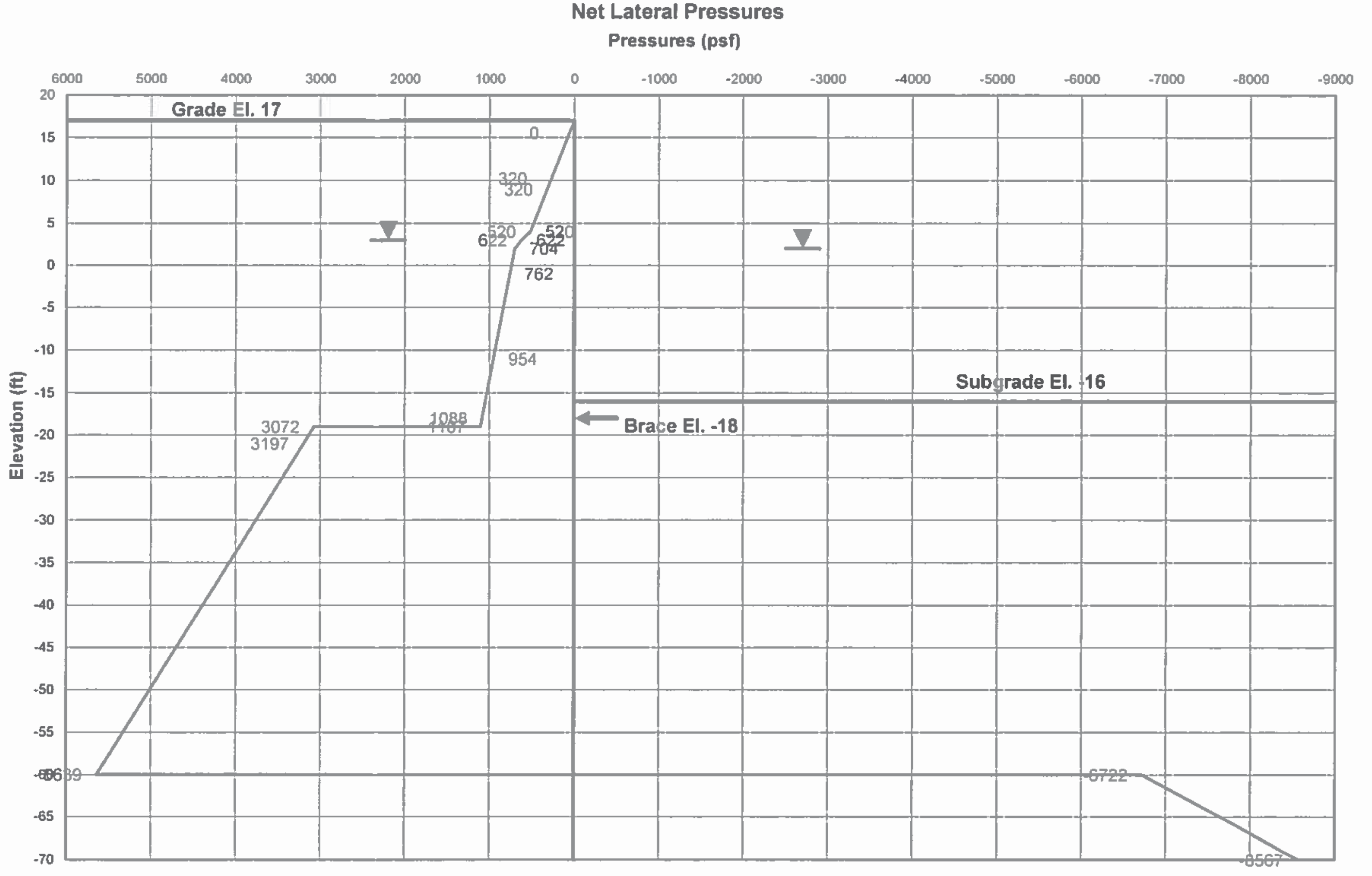
File: 12541

Made By: TC Date: 11/8/2018

FOR First Street Turning Basin

Checked By: SK Date: 11/8/2018

SUBJECT: **CASE I: SOUTH COMBINED WALL-STATIC ANALYSIS CONSTRUCTION SURCHARGE** **Stage 4**



F:\125\12541\60% Design\SOE\06-19-2018 Change of sections\South Wall\EL. -21.5 as subgrade\SOE Staging - South wall

Sheet No. ____ of ____

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC   Date: 11/7/2018

FOR First Street Turning Basin   Checked By: SK   Date: 01/02/2018

SUBJECT:	SOUTH RETAINING WALL: ANALYSIS SUMMARY - WET EXCAVATION	Stage 4

MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows

Subject: FIRST ST TURNING BASIN

Stage 4: Liquefaction case. Refer to Section-B on SOE-300 and SOE-400.

FREE EARTH METHOD
For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.000	0.320	8.00
0.320	0.520	5.00
0.520	0.622	1.00
0.622	0.704	1.00
0.704	1.088	20.00
1.088	1.107	1.00
3.072	3.197	2.00
3.197	5.639	39.00

SUBGRADE

Pressure at slope (ksf): 6.722
Pressure slope (ksf/ft): 0.1845

Flexural rigidity of wall [EI] (k-ft^2): 1449306

Distance from top of wall to anchor (ft): 35

Results from analysis:
----

d = 54.69 ft embedment below z = 33.00
with FS=1.0

Total wall length = 87.69 ft
Depth of embedment = (54.69) → TIP ELEVATION = EL -16 - 54.69 = EL = -70.69 ≈ EL. -70 AS TIP ELEVATION
CHOOSE
Anchor Pull = 119.84 k/ft
Moment at anchor = 281.26 k-ft/ft
Shear at anchor = 97.30 k/ft

Maximum positive moment = 1097.65 k-ft/ft

Maximum moment = 1097.65 k-ft/ft
Location of maximum moment = 60.97 ft below top of wall

Maximum shear = 97.30 k/ft

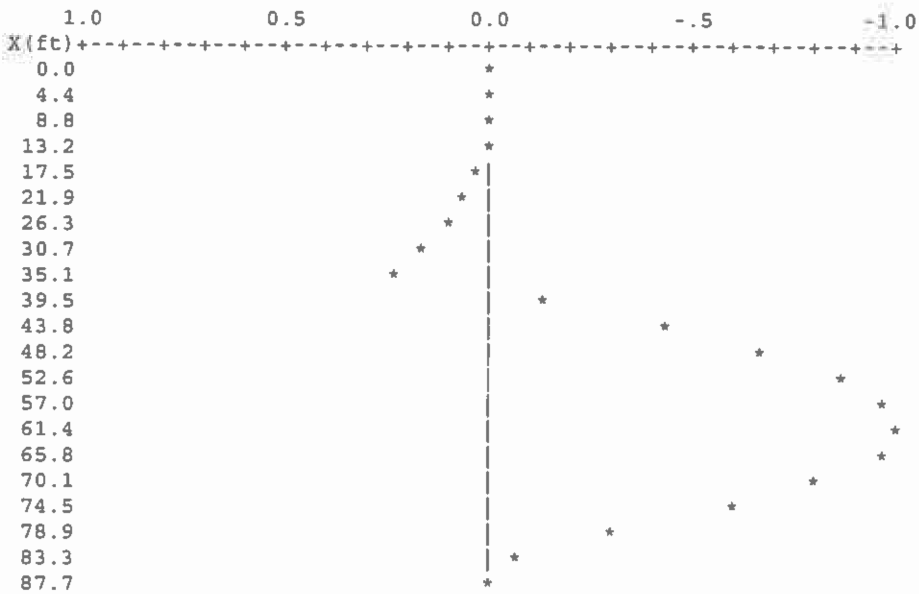
Maximum load = -8.69 ksf/ft
Maximum defl. = 4.13 in at 0.00 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.00	0.00	0.00	4.13
4.38	0.18	0.38	-0.56	3.63
8.77	0.35	1.54	-4.49	3.13
13.15	0.54	3.46	-15.17	2.63
17.54	0.75	6.46	-36.60	2.13
21.92	0.84	9.95	-72.44	1.62
26.31	0.92	13.80	-124.36	1.10
30.69	1.01	18.02	-193.99	0.57
35.07	1.09	-97.22	-274.02	-0.01
39.46	3.29	-85.21	129.44	-0.62
43.84	3.56	-70.19	470.52	-1.19
48.23	3.84	-53.97	743.13	-1.72
52.61	4.11	-36.54	941.97	-2.09
57.00	4.39	-17.91	1061.77	-2.36
61.38	4.66	1.92	1097.25	-2.41
65.76	4.94	22.96	1043.14	-2.34
70.15	5.21	45.20	894.16	-2.04
74.53	5.48	68.65	645.03	-1.66
78.92	-7.08	69.14	313.49	-1.13
83.30	-7.88	36.34	80.97	-0.57
87.69	-8.69	0.00	0.01	0.00

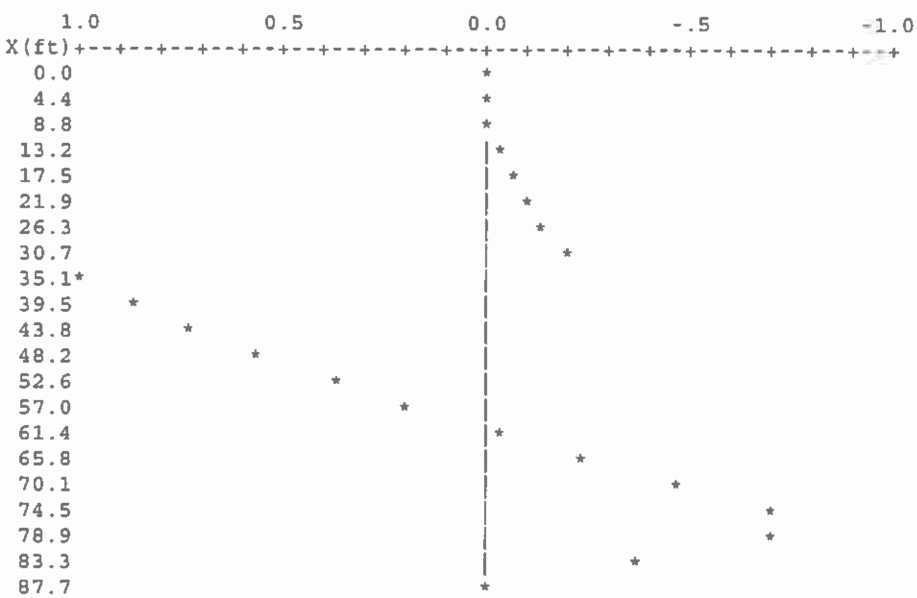
```
                         Pressure     (P/Pmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  4.4                             *|
  8.8                             *|
 13.2                            * |
 17.5                           *  |
 21.9                           *  |
 26.3                           *  |
 30.7                           *  |
 35.1                          *   |
 39.5                   *          |
 43.8                  *           |
 48.2                 *            |
 52.6                *             |
 57.0               *              |
 61.4              *               |
 65.8             *                |
 70.1            *                 |
 74.5           *                  |
 78.9                              |                       *
 83.3                              |                          *
 87.7                              |                             *
```

Moment (M/Mmax)



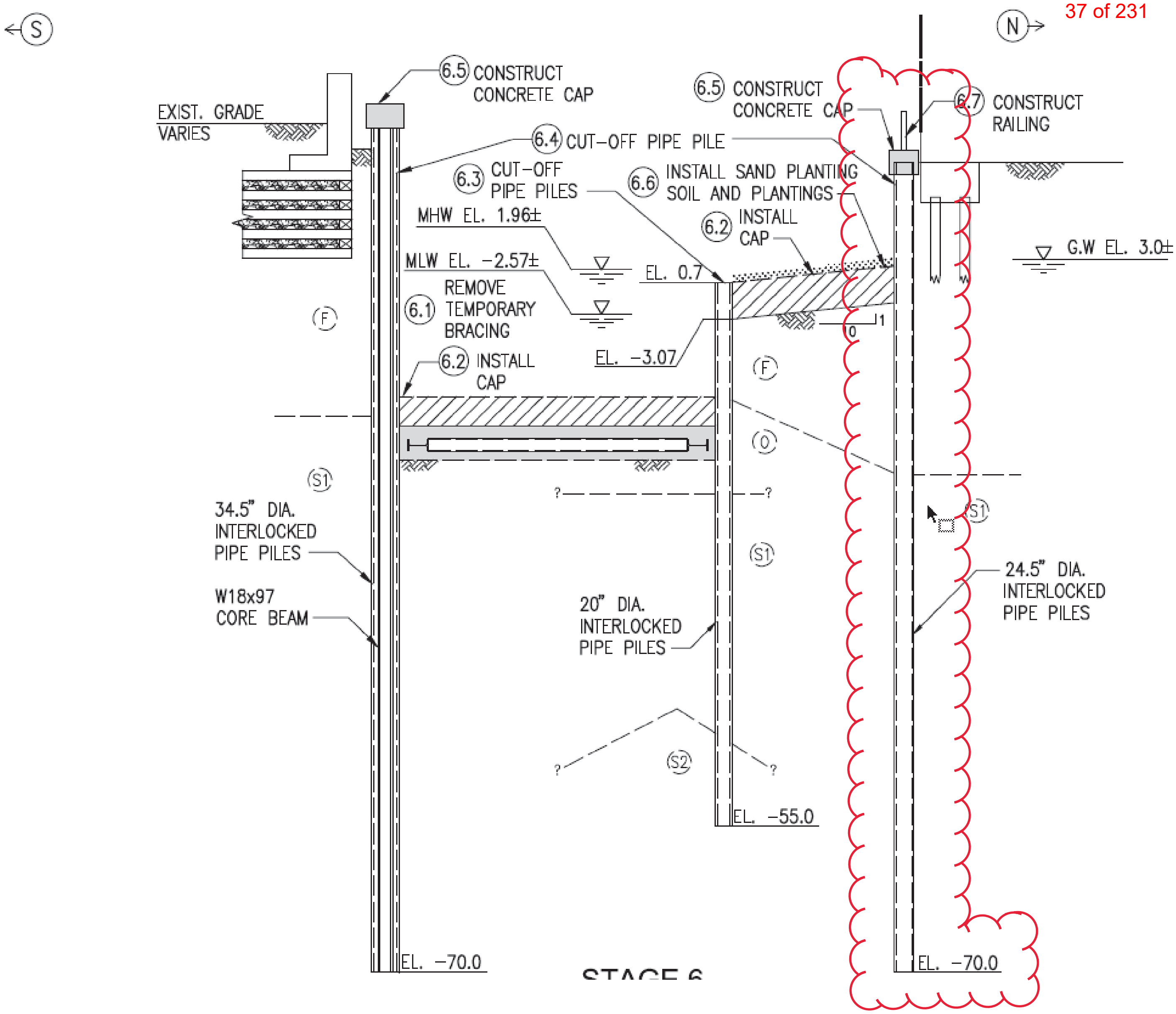
Shear (V/Vmax)



```
                   Deflection     (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                             |                             *
  4.4                             |                         *
  8.8                             |                      *
 13.2                             |                  *
 17.5                             |              *
 21.9                             |           *
 26.3                             |       *
 30.7                             |   *
 35.1                             *
 39.5                          *   |
 43.8                     *        |
 48.2                 *            |
 52.6               *              |
 57.0             *                |
 61.4             *                |
 65.8             *                |
 70.1               *              |
 74.5                  *           |
 78.9                      *       |
 83.3                          *   |
 87.7                             *
```

NORTH AND EAST BULKHEADS
420 CAROLL ST TO 312 3rd AVE
(24.5" DIA. INTERLOCKED PIPE PILE)



24.5" DIA. INTERLOCKED PIPE PILE
PERMANENT CONDITION

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. ______ of ______
File: 12541
Made By: TC Date: 6/25/2018
Checked By: SL Date: 6/25/2018

FOR First Street Turning Basin

SUBJECT: **EFFECTIVE STIFFNESS OF SECTION**

North wall - 24.5" Pipe

Pipe O.D	24.5	in
Pipe t	0.875	in
Pipe I.D	22.75	in
Geometry		
Corrosion Reduction	0.062	in
Pipe O.D	24.376	in
Pipe t	0.813	in
Moment of Inertia		
Pipe	4182	in^4
	2048	in^4/ft
Modulus of elasticity E		
Sheet Pile	29000	ksi

Core steel 0

Moment of Inertia	0	in4
	0	in4/ft
E	29000	ksi

Concrete

Moment of Inertia	13149	in4
E	4000	ksi
n=	7.25	
Transformed I	1814	in4
	888	in4/ft

Composite section

Moment of inertia	2937	in4/ft
S avail.	241	in3/ft
Effective Stiffness of Composite Section		
EIeff	85159502	k-in2/ft
	591385	$k\text{-}ft^2/ft$

Effective stiffness of section without core beam along north wall. Refer to Section-C on SOE-300.

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 12/21/2018

Checked By: Date: 12/21/2018

FOR First Street Turning Basin

SUBJECT: **EFFECTIVE STIFFNESS OF SECTION FOR SOE AT EAST BULKHEAD.**

North wall - 24.5" Pipe

Pipe O.D	24.5	in
Pipe t	0.875	in
Pipe I.D	22.75	in
Geometry		
Corrosion Reduction	0.062	in
Pipe O.D	24.376	in
Pipe t	0.813	in
Moment of Inertia		
Pipe	4182	in^4
	2048	in^4/ft
Modulus of elasticity E		
Sheet Pile	29000	ksi

Core steel W12X106

Moment of Ineria	933	in4
	457	in4/ft
E	29000	ksi

Concrete

Moment of Inertia	12216	in4
E	4000	ksi
n=	7.25	
Transformed I	1685	in4
	825	in4/ft

Composite section

Moment of inertia	3330	in4/ft
S avail.	273	in3/ft
Effective Stiffness of Composite Section		
EIeff	96583992	k-in2/ft
	670722	$k\text{-}ft^2/ft$

Effective stiffness of section with core beam along East Wall. Refer to Section-F on SOE-301.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin

Checked By: TC Date: 4/16/2019

SUBJECT: **SOE STAGING SUMMARY : NORTH & EAST RETAINING WALLS (24.5" DIA. INTERLOCKED PIPE PILES ADJACENT TO 420 & 440 CARROLL ST.)**

	SECTION / STAGE	Brace Reaction	Maximum Wall Moment	Maximum Wall Shear	Subgrade Elevation	Embedment Depth below Subgrade	Minimum Pile Tip Elevation	Max. Deflection	Notes
		-	M_{max}	V_{max}		FS = 1.2	FS = 1.2		
		k/ft	k*ft/ft	k/ft	El.	ft	El.	in	in
Exterior Wall 24.5"x0.875"	**Stage 1 (Grade EL. 13.0)** Subgrade @ El. -3.07	--	177.2	35.3	-3.07	40.6	-43.7	2.2	600 psf construction surcharge
	Stage 1 (Grade EL. 16.0) Subgrade @ El. -3.07	--	203.4	38.6	-3.07	43.0	-46.1	2.5	250 psf construction surcharge
	Stage 2 Permanent case w/ liquefaction	125.9	818.5	94.4	0.7	67.7	-67.0	4.8	No surcharge

*Maximum deflection in each stage occurs at top of wall.

Sheet No. _______ of _______

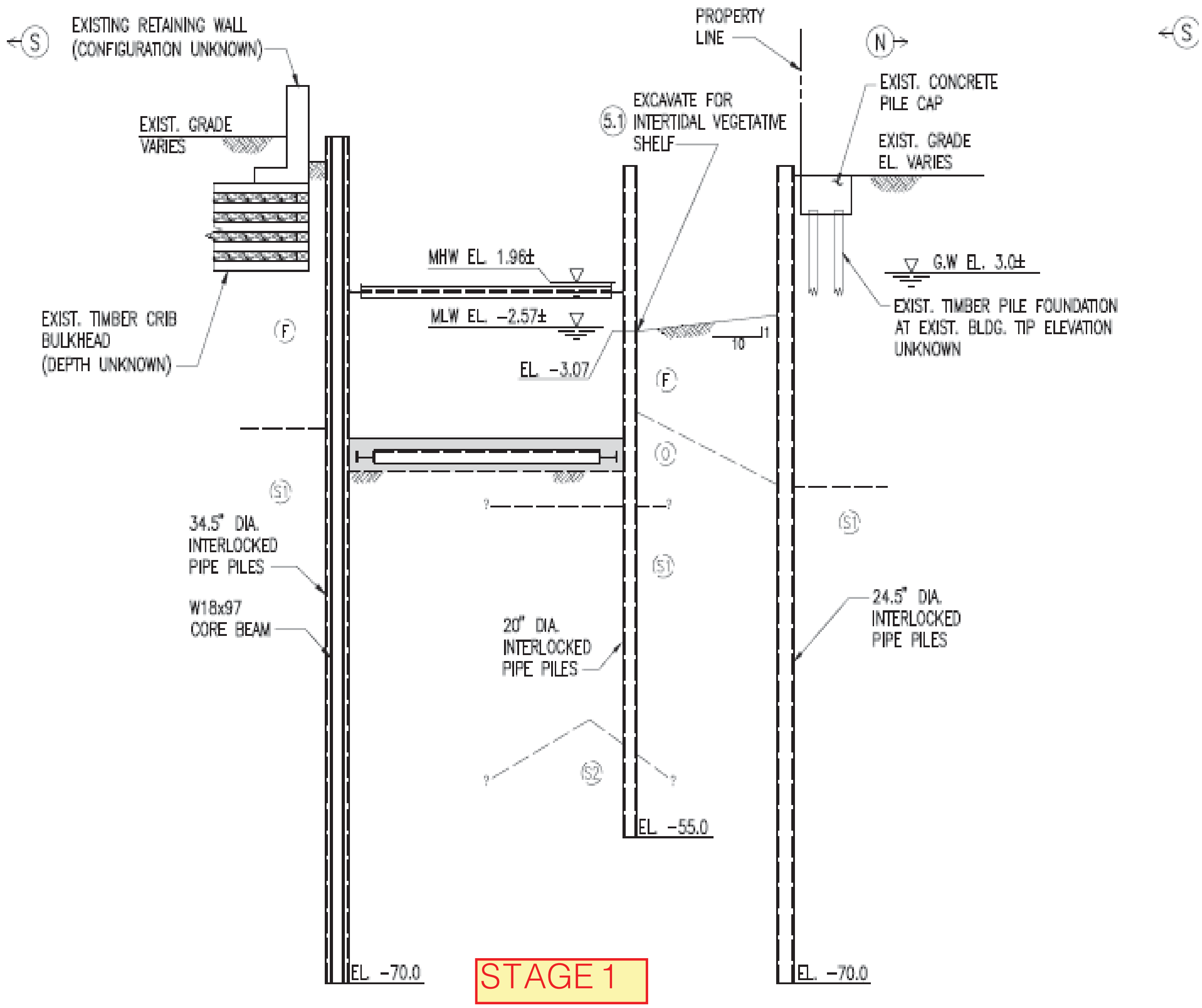
MUESER RUTLEDGE CONSULTING ENGINEERS

		File:	12541
Made By:	SK	Date:	4/16/2019
Checked By:	TC	Date:	4/16/2019

FOR First Street Turning Basin

SUBJECT: **SOE STAGING SUMMARY : NORTH & EAST RETAINING WALLS (24.5" DIA. INTERLOCKED PIPE PILES ADJACENT TO 420 & 440 CARROLL ST.)**

	Check				
	fy	50	ksi		
Reqd S	M/0.6fy	81.38	in^3/ft	(Static)	Ext Wall
	M/fy	196.44	in^3/ft	(Seismic)	Ext Wall
Ext Wall	24.5"x0.875" pipe				
	Max M	203.4	k-ft	(Static)	
		818.5	k-ft	(Seismic)	
	Max V	94.4	k/ft		
	S available	241.0	in3/ft	OK	
	Stress (static)	10.1	ksi		
	Stress (seismic)	40.8	ksi		
	Shear area available	34.7	in^2/ft		
	Shear area reqd	4.7	in^2/ft	OK	



EXCAVATE TO EL. -38 ALONG INTERTIDAL VEGETATIVE SHELF

SCALE: 3/32"=1'-0"

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin Checked By: Date: 4/16/2019

SUBJECT: **NORTH WALL - SOE STAGING** **Stage 1**

Lateral Earth Pressures: Stage 1(North Wall): Excavate to EL. -3.07 with grade at EL. 13.0 and 600 psf construction surcharge. Refer to Section-C on SOE-300 and SOE-400.

	DRIVING FORCES										RESISTING FORCES								
Layer[1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	600psf Construction Surcharge (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
	13	0	120	0	0.333		1.00	0	240	0								240	13
	5	8	120	960	0.333		1.00	320	240	0								560	5
	5	0	120	960	0.333		1.00	320	240	0								560	5
	4	1	120	1080	0.333		1.00	360	240	0								600	4
	4	0	120	1080	0.333		1.00	360	240	0								600	4
	3	1	120	1200	0.333		1.00	400	240	62								702	3
	3	0	57.6	1200	0.333		1.00	400	100	62								562	3
F	2	1	57.6	1258	0.333		1.00	419	100	125								644	2
	2	0	57.6	1258	0.333		1.00	419	100	125								644	2
	-3.07	5.07	57.6	1550	0.333		1.00	517	100	125								741	-3.07
	-3.07	0	57.6	1550	0.333		1.00	517	100	125	0	57.6	0	3.0	1.00		0	741	-3.07
	-7	3.93	57.6	1776	0.333		1.00	592	100	125	3.93	57.6	226	3.0	1.00		-679	138	-7
	-7	0	57.6	1776	0.333		1.00	592	0	125	0	57.6	226	3.0	1.00		-679	38	-7
	-17	10	57.6	2352	0.333		1.00	784		125	10	57.6	802	3.0	1.00		-2407	-1498	-17
	-17	0	57.6	2352	0.333		1.00	784		125	0	57.6	802	3.00	1.00		-2407	-1498	-17
	-19	2	57.6	2467	0.333		1.00	822		125	2	57.6	918	3.00	1.00		-2753	-1806	-19
	-19	0	62.6	2467	0.307		1.00	758		125	0	62.6	918	3.25	1.00		-2986	-2103	-19
S	-21	2	62.6	2592	0.307		1.00	797		125	2	62.6	1043	3.25	1.00		-3394	-2472	-21
	-21.5	0.5	62.6	2624	0.307		1.00	806		125	0.5	62.6	1074	3.25	1.00		-3496	-2565	-21.5
	-30	8.5	62.6	3156	0.307		1.00	970		125	8.5	62.6	1606	3.25	1.00		-5227	-4133	-30

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade slopes from ~El. 0.0 to ~El.-1 .0 so avg. EL. -0.5 used as subgrade

[3] Full passive used for analysis.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

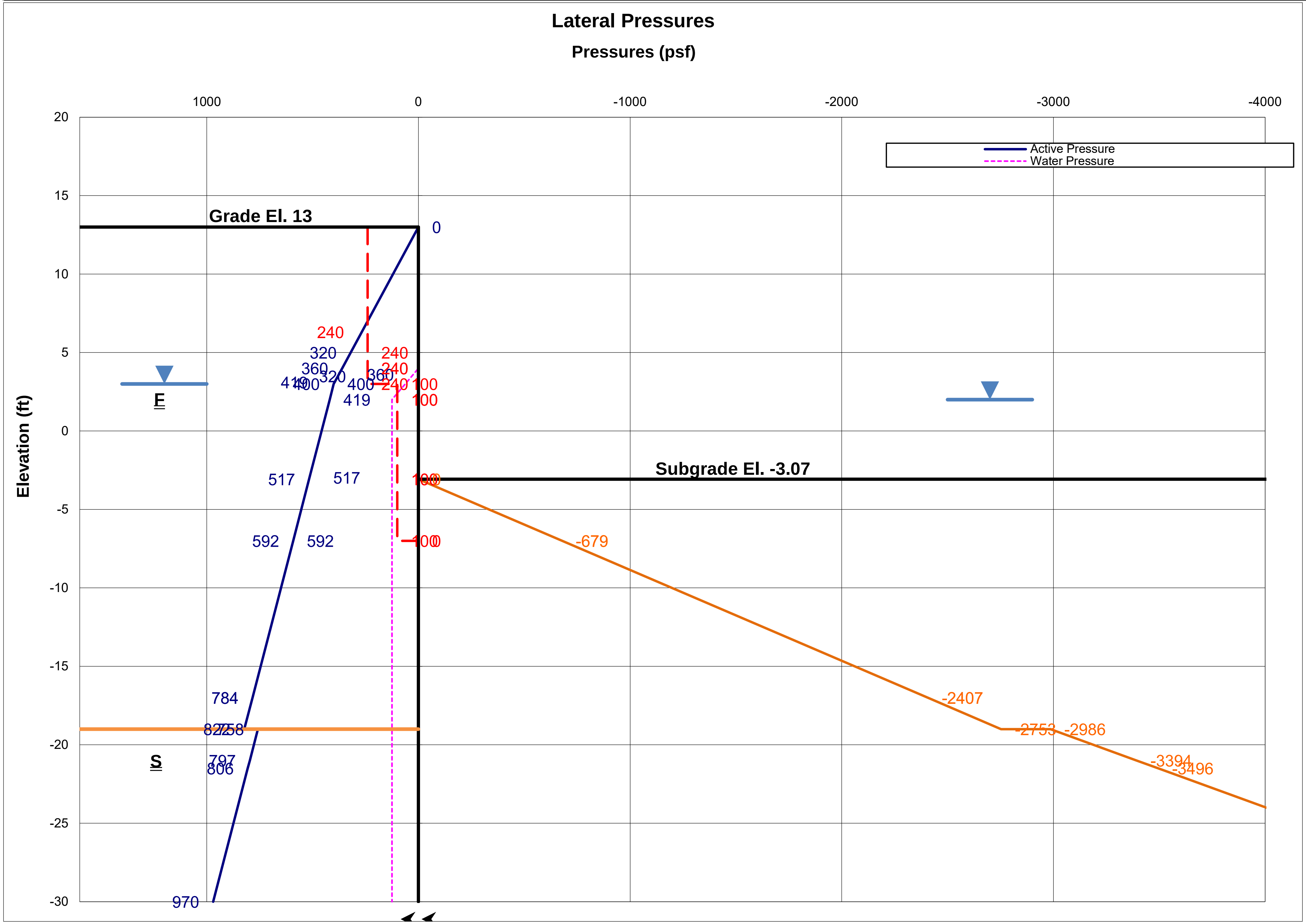
File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin

Checked By: Date: 4/16/2019

SUBJECT: **NORTH WALL - SOE STAGING** **Stage 1**



Net Lateral Pressures

Sheet No. _______ of _______

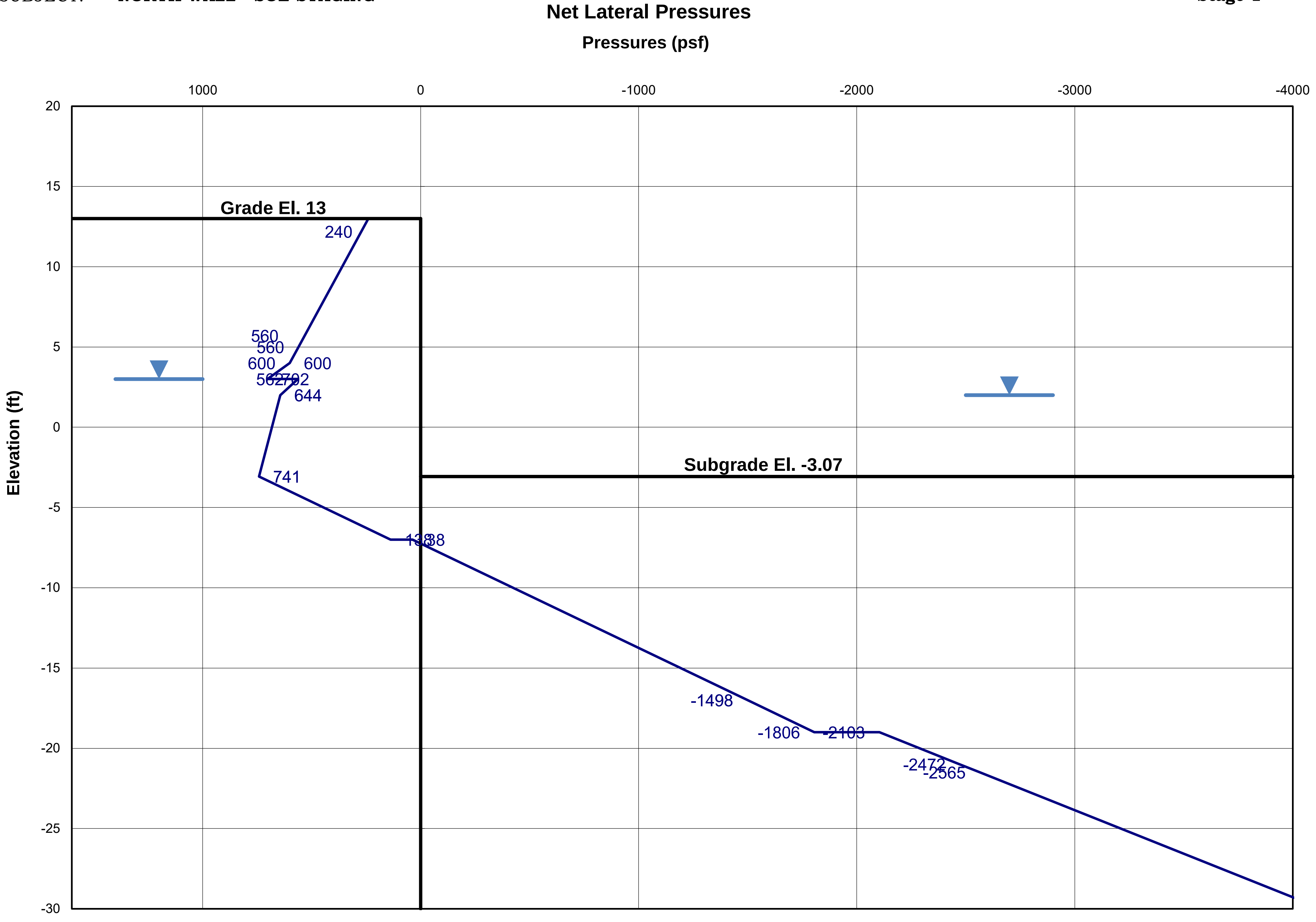
MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin Checked By: Date: 4/16/2019

SUBJECT: **NORTH WALL - SOE STAGING** **Stage 1**



MUESER RUTLEDGE CONSULTING ENGINEERS

NORTH WALL

Cantilever v3.0 BETA for Windows, 32-bit

Subject: Stage 1: Excavate to EL. -3.07 with grade at EL. 13.0 and 600 psf construction surcharge. Refer to Section-C on SOE-300 and SOE-400. Cantilevered North Wall.

INPUT

P	Q	Interval Lengths
0.240	0.560	8.000
0.560	0.600	1.000
0.600	0.702	1.000
0.562	0.644	1.000
0.644	0.741	5.070
0.741	0.138	3.930
0.038	-1.498	10.000
-1.498	-1.806	2.000

Passive pressure at subgrade : 2.103
Passive pressure slope : .186
Flexural rigidity : 591385

OUTPUT

At end of int. 1, Shear= 3.20, Moment= 11.09
At end of int. 2, Shear= 3.78, Moment= 14.58
At end of int. 3, Shear= 4.43, Moment= 18.68
At end of int. 4, Shear= 5.03, Moment= 23.40
At end of int. 5, Shear= 8.54, Moment= 57.62
At end of int. 6, Shear= 10.27, Moment= 95.37
At end of int. 7, Shear= 2.97, Moment= 174.39
At end of int. 8, Shear= -0.33, Moment= 177.13

D= 11.14 embedment below subgrade with F.S.= 1

Total Length of sheetpile is 43.14

Depth of max. moment= 31.81

Max. moment= 177.17

Depth of max. shear= 43.14
Max. shear= 35.30

X	V	M	Defl.
0.00	0.00	0.00	0.18
2.16	0.61	0.63	0.16
4.31	1.41	2.77	0.15
6.47	2.39	6.83	0.14
8.63	3.56	13.21	0.12
10.78	4.90	22.33	0.11
12.94	6.32	34.42	0.10
15.10	7.83	49.67	0.08
17.26	9.32	68.23	0.07
19.41	10.16	89.37	0.06
21.57	10.14	111.44	0.05
23.73	9.35	132.59	0.04
25.88	7.84	151.25	0.03
28.04	5.61	165.89	0.02
30.20	2.67	174.95	0.01
32.35	-1.09	176.88	0.01
34.51	-6.20	169.18	0.00
36.67	-12.18	149.51	0.00
38.83	-19.02	116.02	0.00
40.98	-26.73	66.84	0.00
43.14	-35.30	0.11	0.00

```
   Moment  (M/Mmax)

   -1.0           -0.5            0.0           0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  2.2                              |:
  4.3                              |:
  6.5                              |:
  8.6                              | :
 10.8                              |   :
 12.9                              |     :
 15.1                              |       :
 17.3                              |           :
 19.4                              |              :
 21.6                              |                  :
 23.7                              |                     :
 25.9                              |                         :
 28.0                              |                           :
 30.2                              |                             :
 32.4                              |                             :
 34.5                              |                            :
 36.7                              |                        :
 38.8                              |                   :
 41.0                              |          :
 43.1                              |:

   Shear  (V/Vmax)

   -1.0           -0.5            0.0           0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  2.2                              |:
  4.3                              |:
  6.5                              | :
  8.6                              |  :
 10.8                              |   :
 12.9                              |    :
 15.1                              |      :
 17.3                              |       :
 19.4                              |        :
 21.6                              |        :
 23.7                              |       :
 25.9                              |      :
 28.0                              |    :
 30.2                              | :
 32.4                             :|
 34.5                        :     |
 36.7                   :          |
 38.8             :                |
 41.0       :                      |
 43.1:                             |
```

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK   Date: 12/21/2018

FOR First Street Turning Basin   Checked By: Date: 12/21/2018

SUBJECT: **SOE STAGING AT NORTHEAST CORNER AND EAST WALL**   **Stage 1**

Lateral Earth Pressures: Stage 1 (East Wall): Excavate to EL. -3.07 with grade at EL. 16.0 and 250 psf surcharge. Refer to Section-F on SOE-301 and SOE-401.

DRIVING FORCES											RESISTING FORCES								
Layer [1]	Elev	H	γ	σ_v	k_a	c	R_a	Active Pressure	250psf Construction Surcharge	Water Pressure	H	γ	σ_v	k_p	R_p	c	Passive Pressure	Net Pressure	Elev
	[ft]	[ft]	[pcf]	[psf]		[psf]		[psf]	(psf)	(psf)	[ft]	[pcf]	[psf]		[psf]	[psf]	[psf]	[psf]	[ft]
	16	0	120	0	0.333		1.00	0	100	0								100	16
	6	10	120	1200	0.333		1.00	400	100	0								500	6
	6	0	120	1200	0.333		1.00	400	50	0								450	6
	4	2	120	1440	0.333		1.00	480	50	0								530	4
	4	0	120	1440	0.333		1.00	480	50	0								530	4
	3	1	120	1560	0.333		1.00	520	50	62								632	3
	3	0	57.6	1560	0.333		1.00	520	50	62								632	3
F	2	1	57.6	1618	0.333		1.00	539	50	125								714	2
	2	0	57.6	1618	0.333		1.00	539	50	125								714	2
	-3.07	5.07	57.6	1910	0.333		1.00	637	50	125								811	-3.07
	-3.07	0	57.6	1910	0.333		1.00	637	50	125	0	57.6	0	3.0	1.00		0	811	-3.07
	-4	0.93	57.6	1963	0.333		1.00	654	50	125	0.93	57.6	54	3.0	1.00		-161	668	-4
	-4	0	57.6	1963	0.333		1.00	654	0	125	0	57.6	54	3.0	1.00		-161	618	-4
	-17	13	57.6	2712	0.333		1.00	904		125	13	57.6	802	3.0	1.00		-2407	-1378	-17
	-17	0	57.6	2712	0.333		1.00	904		125	0	57.6	802	3.00	1.00		-2407	-1378	-17
	-19	2	57.6	2827	0.333		1.00	942		125	2	57.6	918	3.00	1.00		-2753	-1686	-19
	-19	0	62.6	2827	0.307		1.00	869		125	0	62.6	918	3.25	1.00		-2986	-1993	-19
S	-21	2	62.6	2952	0.307		1.00	907		125	2	62.6	1043	3.25	1.00		-3394	-2362	-21
	-21.5	0.5	62.6	2984	0.307		1.00	917		125	0.5	62.6	1074	3.25	1.00		-3496	-2454	-21.5
	-30	8.5	62.6	3516	0.307		1.00	1080		125	8.5	62.6	1606	3.25	1.00		-5227	-4022	-30

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade slopes from ~El. 0.0 to ~El.-1 .0 so avg. EL. -0.5 used as subgrade

[3] Full passive used for analysis.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

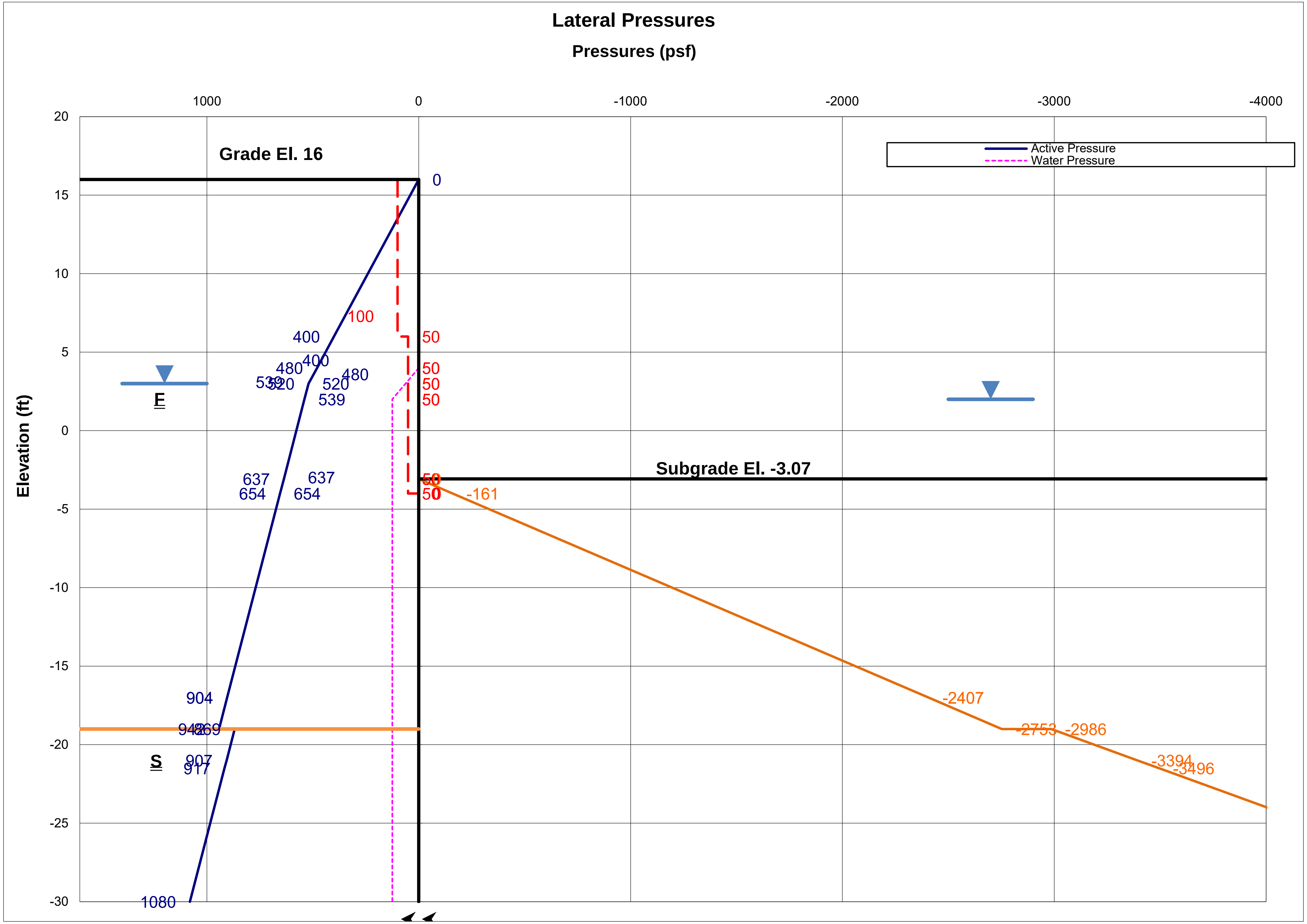
File: 12541

Made By: SK Date: 12/21/2018

FOR First Street Turning Basin

Checked By: Date: 12/21/2018

SUBJECT: **SOE STAGING. AT NORTHEAST CORNER AND EAST WALL** **Stage 1**



Net Lateral Pressures

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

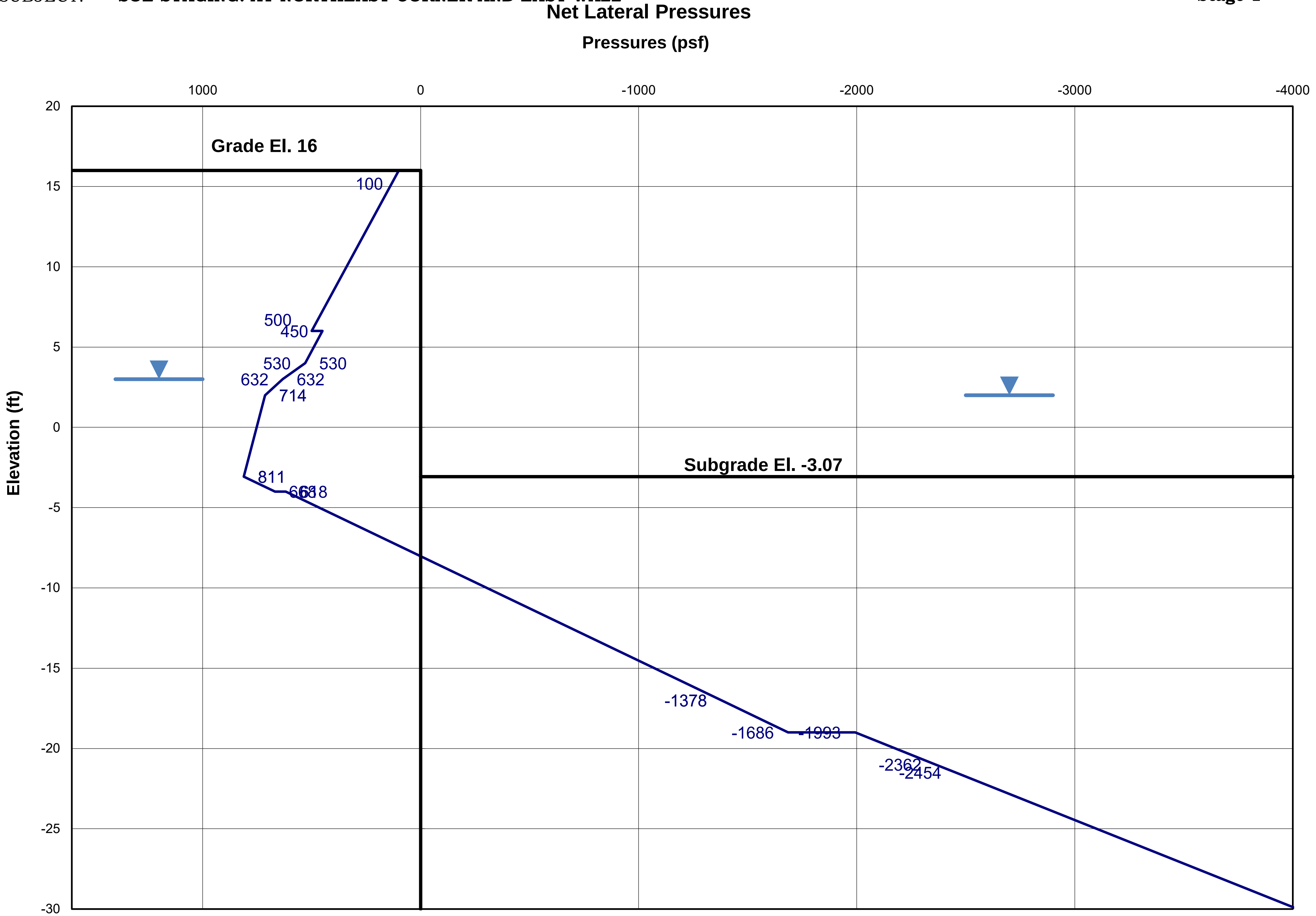
File: 12541

Made By: SK Date: 12/21/2018

FOR First Street Turning Basin

Checked By: Date: 12/21/2018

SUBJECT: **SOE STAGING. AT NORTHEAST CORNER AND EAST WALL** **Stage 1**



MUESER RUTLEDGE CONSULTING ENGINEERS

NORTHEAST CORNER AND EAST WALL

Cantilever v3.0 BETA for Windows, 32-bit

Subject: Stage 1: Excavate to EL. -3.07 with grade at EL. 16.0 and 250 psf surcharge - Cantilevered east wall. Refer to Section-F on SOE-301 and SOE-401.

INPUT

P	Q	Interval Lengths
0.100	0.500	10.000
0.450	0.530	2.000
0.530	0.632	1.000
0.632	0.714	1.000
0.714	0.811	5.070
0.811	0.668	0.930
0.618	-1.378	13.000
-1.378	-1.686	2.000

Passive pressure at subgrade : 1.993
Passive pressure slope : .184
Flexural rigidity : 752100

OUTPUT

At end of int. 1, Shear= 3.00, Moment= 11.67
At end of int. 2, Shear= 3.98, Moment= 18.62
At end of int. 3, Shear= 4.56, Moment= 22.88
At end of int. 4, Shear= 5.23, Moment= 27.77
At end of int. 5, Shear= 9.10, Moment= 63.90
At end of int. 6, Shear= 9.79, Moment= 72.69
At end of int. 7, Shear= 4.85, Moment= 195.93
At end of int. 8, Shear= 1.78, Moment= 202.67

D= 12.74 embedment below subgrade with F.S.= 1

Total Length of sheetpile is 47.74

Depth of max. moment= 35.86
Max. moment= 203.44

Depth of max. shear= 47.74
Max. shear= 38.55

X	V	M	Defl.
0.00	0.00	0.00	0.19

2.39	0.35	0.38	0.18
4.77	0.93	1.87	0.16
7.16	1.74	5.01	0.15
9.55	2.78	10.36	0.13
11.94	3.95	18.37	0.12
14.32	5.47	29.50	0.11
16.71	7.24	44.64	0.09
19.10	9.12	64.15	0.08
21.48	10.54	87.82	0.07
23.87	11.03	113.73	0.05
26.26	10.65	139.78	0.04
28.65	9.39	163.87	0.03
31.03	7.26	183.93	0.02
33.42	4.26	197.85	0.02
35.81	0.12	203.44	0.01
38.19	-5.52	197.20	0.01
40.58	-12.21	176.25	0.00
42.97	-19.94	138.09	0.00
45.36	-28.72	80.22	0.00
47.74	-38.55	0.14	0.00

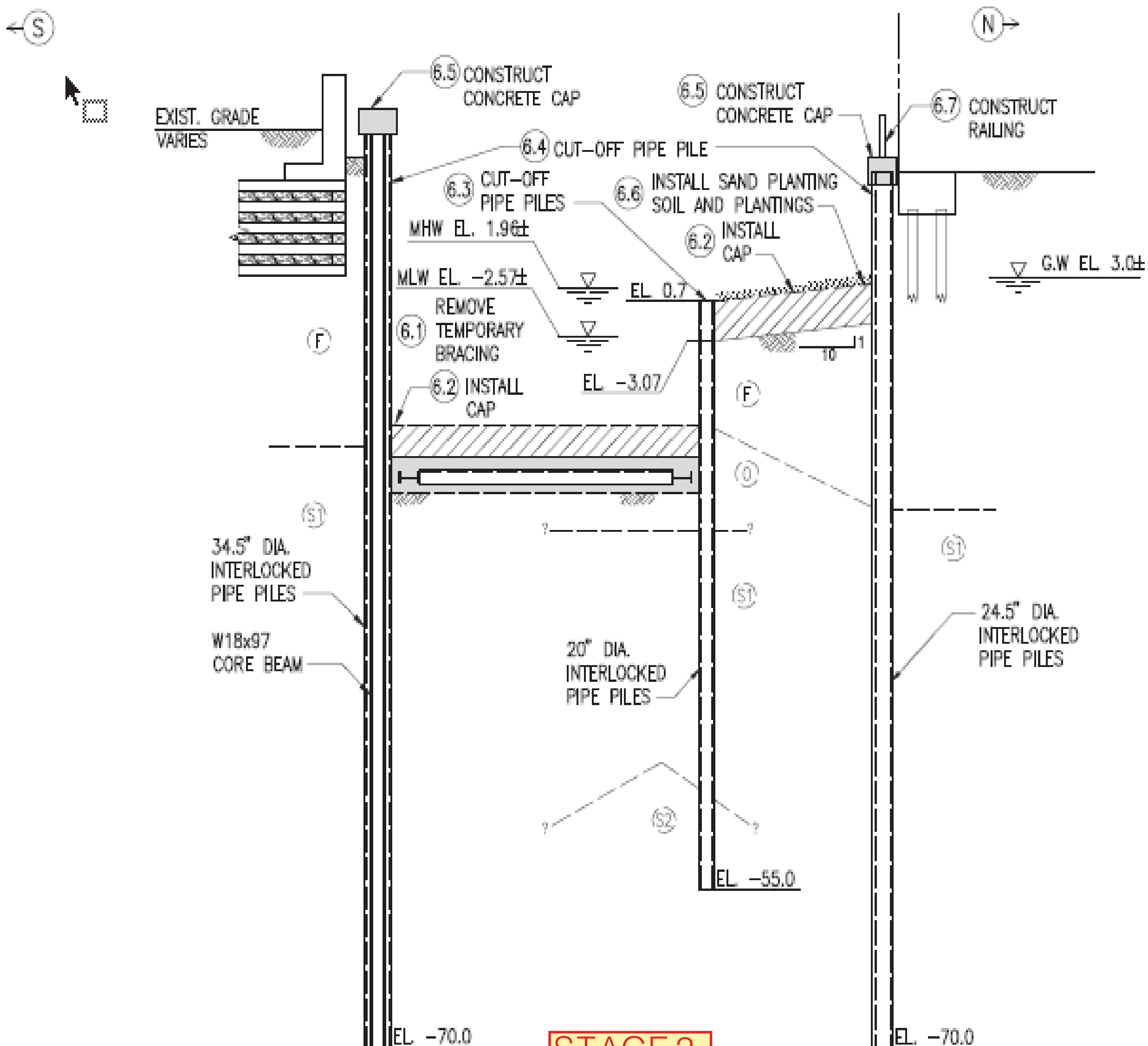
```
                 Moment   (M/Mmax)


   -1.0           -0.5            0.0          0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  2.4                              |:
  4.8                              |:
  7.2                              |:
  9.5                              | :
 11.9                              |  :
 14.3                              |   :
 16.7                              |      :
 19.1                              |        :
 21.5                              |            :
 23.9                              |                :
 26.3                              |                    :
 28.6                              |                       :
 31.0                              |                          :
 33.4                              |                            :
 35.8                              |                             :
 38.2                              |                            :
 40.6                              |                         :
 43.0                              |                   :
 45.4                              |           :
 47.7                              |:

                 Shear   (V/Vmax)


   -1.0           -0.5            0.0          0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
```

```
 2.4                              |:
 4.8                              |:
 7.2                              |:
 9.5                              | :
11.9                              |  :
14.3                              |   :
16.7                              |     :
19.1                              |      :
21.5                              |       :
23.9                              |        :
26.3                              |       :
28.6                              |      :
31.0                              |     :
33.4                              |  :
35.8                              |:
38.2                         :    |
40.6                    :         |
43.0              :               |
45.4       :                      |
47.7:                             |
```



STAGE 2

REMOVE TEMPORARY BRACING, INSTALL BASIN, INTERTIDAL VEGETATIVE CAP, INSTALL CONCRETE BUKHEAD CAP, PLANTINGS, AND RAILINGS

SCALE: 3/32"=1'-0"

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 12/20/2018

FOR First Street Turning Basin Checked By: Date: 12/20/2018

SUBJECT: **NORTH WALL. LIQUEFACTION CASE** **Stage 2**

Lateral Earth Pressures: For Anchwall Analysis Bottom of liquefiable layer @ EL -60 Liquefaction case: Refer to Section-F on SOE-301 and SOE-401.

DRIVING FORCES											RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	No Construction Surcharge (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	17	0	120	0	0.333		1.00	0		0								0	17
	7	10	120	1200	0.333		1.00	400		0								400	7
	7	0	120	1200	0.333		1.00	400		0								400	7
	4	3	120	1560	0.333		1.00	520		0								520	4
	4	0	120	1560	0.333		1.00	520		0								520	4
	3	1	120	1680	0.333		1.00	560		62								622	3
	3	0	57.6	1680	0.333		1.00	560		62								622	3
	2	1	57.6	1738	0.333		1.00	579		125								704	2
	2	0	57.6	1738	0.333		1.00	579		125								704	2
	0.7	1.3	57.6	1812	0.333		1.00	604		125								729	0.7
	0.7	0	57.6	1812	0.333		1.00	604		125	0	57.6	0	0.0	1.00		0	729	0.7
	-7	7.7	57.6	2256	0.333		1.00	752		125	7.7	57.6	444	0.0	1.00		0	877	-7
	-7	0	57.6	2256	0.333		1.00	752		125	0	57.6	444	0.0	1.00		0	877	-7
	-17	10	57.6	2832	0.333		1.00	944		125	10	57.6	1020	0.0	1.00		0	1069	-17
	-17	0	57.6	2832	0.333		1.00	944		125	0	57.6	1020	0.00	1.00		0	1069	-17
	-19	2	57.6	2947	0.333		1.00	982		125	2	57.6	1135	0.00	1.00		0	1107	-19
S	-19	0	62.6	2947	1.000		1.00	2947		125	0	62.6	1135	0.00	1.00		0	3072	-19
	-60	41	62.6	5514	1.000		1.00	5514		125	41	62.6	3701	0.00	1.00		0	5639	-60
	-60	0	62.6	5514	0.307		1.00	1694		125	0	62.6	3701	3.25	1.00		-12046	-10227	-60
	-70	10	62.6	6140	0.307		1.00	1887		125	10	62.6	4327	3.25	1.00		-14084	-12072	-70
	-70	0	62.6	6140	0.307		1.00	1887		125	0	62.6	4327	3.25	1.00		-14084	-12072	-70

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade slopes from ~El. 1.5 to ~El.0 - so avg. EL. 1 used as subgrade

[3] Full passive used for analysis.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

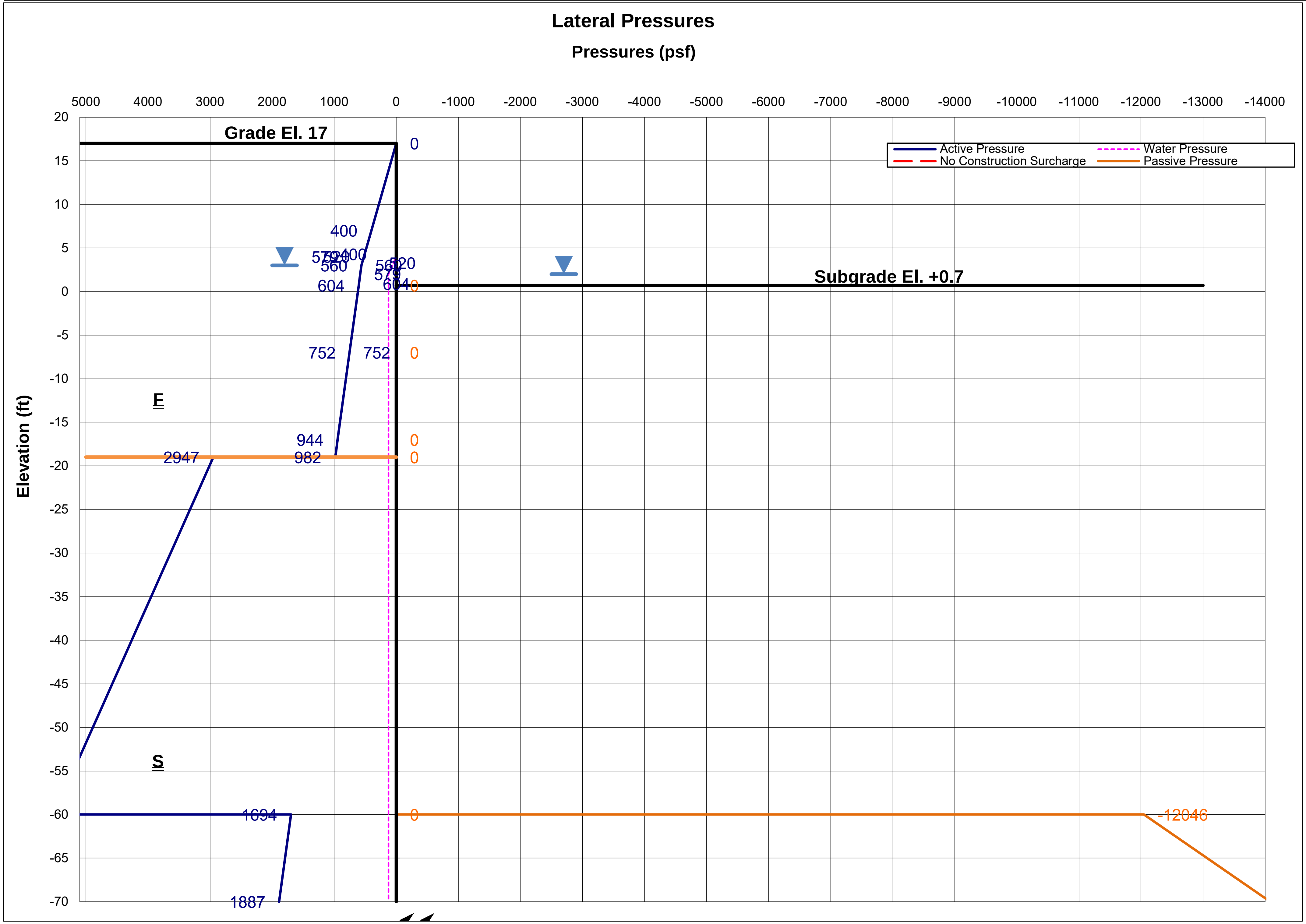
File: 12541

Made By: SK Date: 12/20/2018

Checked By: Date: 12/20/2018

FOR First Street Turning Basin

SUBJECT: **NORTH WALL. LIQUEFACTION CASE** **Stage 2**



Net Lateral Pressures

Sheet No. _______ of _______

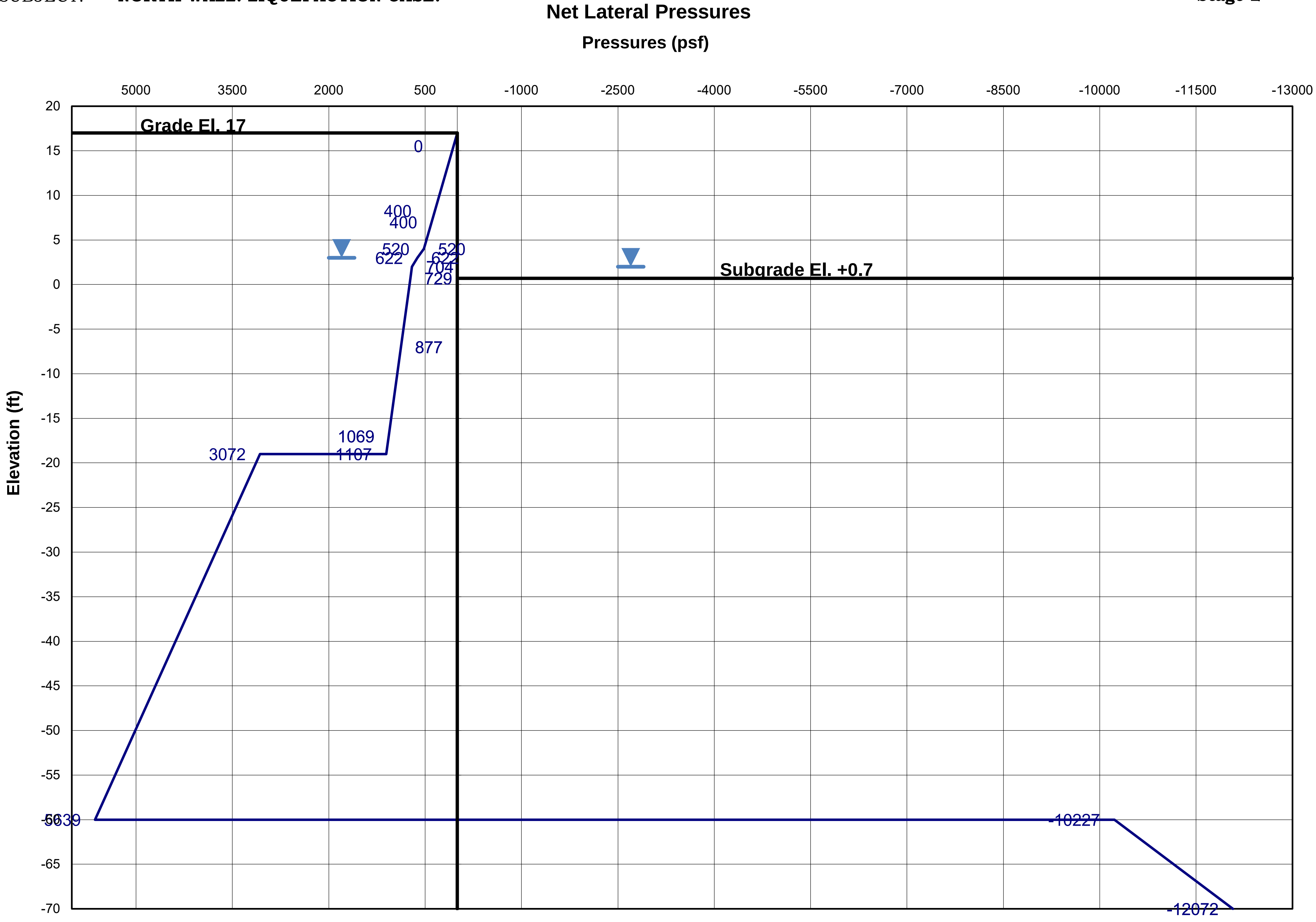
MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 12/20/2018

FOR First Street Turning Basin Checked By: Date: 12/20/2018

SUBJECT: **NORTH WALL. LIQUEFACTION CASE.** **Stage 2**



MADE BY: SK

12/20/18

MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows

NORTH WALL LIQUEFACTION CASE

Subject: FIRST ST TURNING BASIN

Liquefaction case: Refer to Section-F on SOE-301 and SOE-401.

FREE EARTH METHOD
For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.000	0.400	10.00
0.400	0.520	3.00
0.520	0.622	1.00
0.622	0.704	1.00
0.704	0.729	1.30 — TA SUBGRADE
0.729	0.877	7.70
0.877	1.069	10.00
1.069	1.107	2.00
3.072	5.639	41.00

Pressure at slope (ksf): 10.227
Pressure slope (ksf/ft): 0.1845

Flexural rigidity of wall [EI] (k-ft^2): 591385

Distance from top of wall to anchor (ft): 38.5

Results from analysis:

d = 67.72 ft embedment below z = 16.30
with FS=1.0

Total wall length = 84.02 ft

Anchor Pull = 125.91 k/ft
Moment at anchor = 373.22 k-ft/ft
Shear at anchor = 94.40 k/ft

Maximum positive moment = 818.51 k-ft/ft

Maximum moment = 818.51 k-ft/ft
Location of maximum moment = 62.27 ft below top of wall

Maximum shear = 94.40 k/ft

Maximum load = -11.52 ksf/ft
Maximum defl. = 4.78 in at 0.00 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.00	0.00	0.00	4.78
4.20	0.17	0.35	-0.49	4.32
8.40	0.34	1.41	-3.95	3.86
12.60	0.50	3.18	-13.34	3.40
16.80	0.74	5.91	-32.06	2.93
21.00	0.82	9.19	-63.66	2.46
25.20	0.90	12.80	-109.73	1.95
29.41	0.98	16.75	-171.67	1.42
33.61	1.06	21.04	-250.93	0.81
37.81	3.19	29.29	-352.16	0.14
42.01	3.45	-82.69	-62.36	-0.70
46.21	3.71	-67.65	253.82	-1.56
50.41	3.97	-51.51	504.50	-2.29
54.61	4.24	-34.26	685.05	-2.91
58.81	4.50	-15.91	790.82	-3.19
63.01	4.76	3.55	817.18	-3.29
67.21	5.03	24.11	759.49	-3.00
71.41	5.29	45.77	613.10	-2.52
75.61	5.55	68.55	373.37	-1.76
79.82	-10.75	46.77	99.46	-0.90
84.02	-11.52	0.00	0.08	0.00

```
                                   Pressure    (P/Pmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  4.2                              *
  8.4                             *|
 12.6                             *|
 16.8                            * |
 21.0                            * |
 25.2                            * |
 29.4                           *  |
 33.6                           *  |
 37.8                      *       |
 42.0                     *        |
 46.2                    *         |
 50.4                    *         |
 54.6                   *          |
 58.8                  *           |
 63.0                  *           |
 67.2                 *            |
 71.4                *             |
 75.6                *             |
 79.8                              |                           *
 84.0                              |                             *
```

```
                           Moment    (M/Mmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  4.2                              *
  8.4                              *
 12.6                              *
 16.8                             *|
 21.0                            * |
 25.2                          *   |
 29.4                        *     |
 33.6                     *        |
 37.8                 *            |
 42.0                            * |
 46.2                              |        *
 50.4                              |                 *
 54.6                              |                        *
 58.8                              |                            *
 63.0                              |                             *
 67.2                              |                           *
 71.4                              |                     *
 75.6                              |             *
 79.8                              |   *
 84.0                              *
```

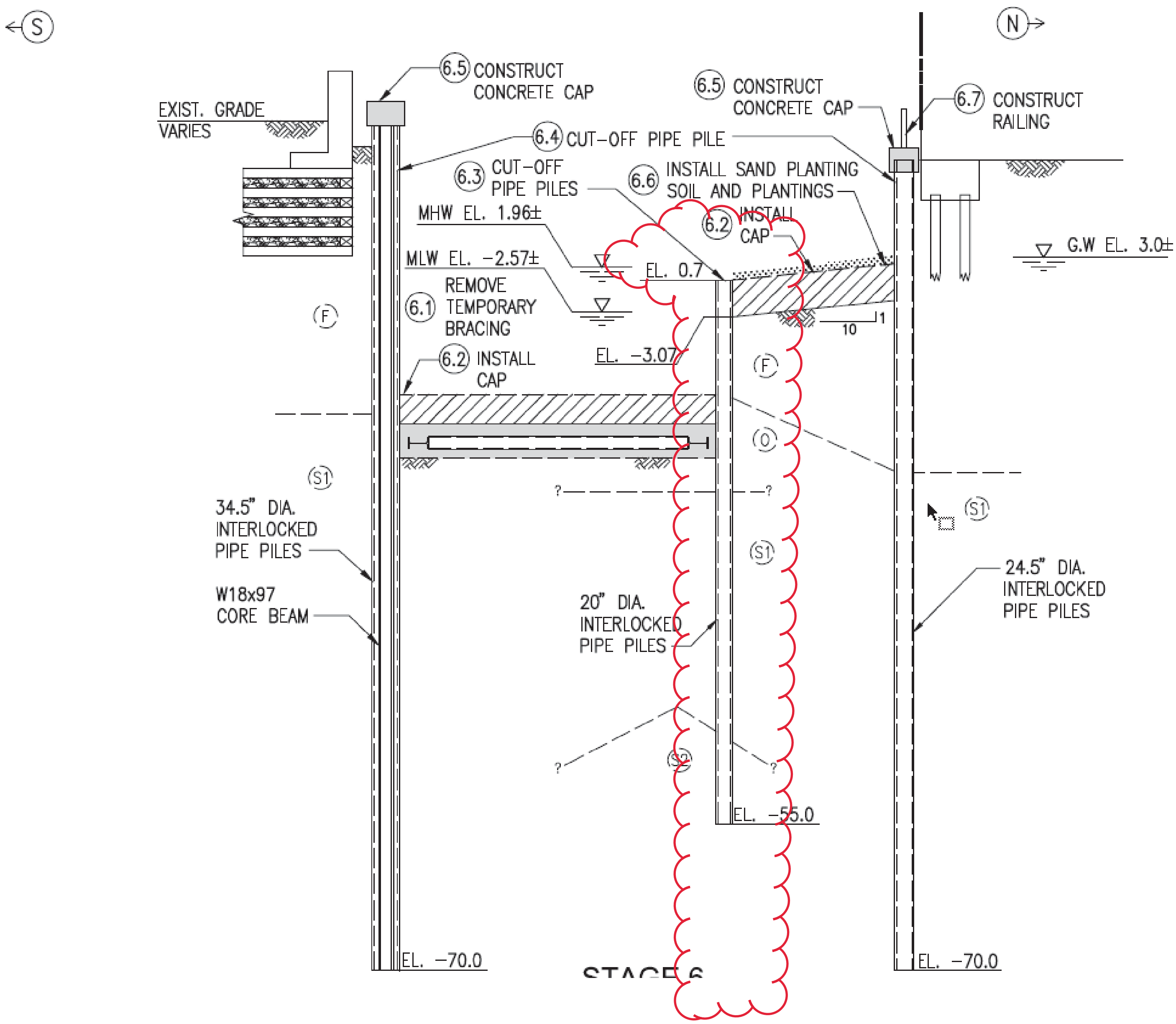
```
                            Shear    (V/Vmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  4.2                              *
  8.4                              *
 12.6                              |*
 16.8                              | *
 21.0                              |  *
 25.2                              |   *
 29.4                              |    *
 33.6                              |      *
 37.8                              |        *
 42.0    *                         |
 46.2         *                    |
 50.4              *               |
 54.6                   *          |
 58.8                         *    |
 63.0                              |*
 67.2                              |       *
 71.4                              |              *
 75.6                              |                     *
 79.8                              |              *
 84.0                              *
```

```
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5          -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              |                             *
  4.2                              |                          *
  8.4                              |                       *
 12.6                              |                    *
 16.8                              |                 *
 21.0                              |              *
 25.2                              |           *
 29.4                              |        *
 33.6                              |    *
 37.8                              |*
 42.0                          *   |
 46.2                    *         |
 50.4                *             |
 54.6            *                 |
 58.8          *                   |
 63.0         *                    |
 67.2           *                  |
 71.4              *               |
 75.6                   *          |
 79.8                        *     |
 84.0                              *
```

INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF (20" DIA. INTERLOCKED PIPE PILES)



20" DIA. INTERLOCKED PIPE PILE
PERMANENT CONDITION

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

FOR	First Street Turning Basin	Made By: TC	Date: 6/25/2018
		Checked By: SE	Date: 6/25/2018
SUBJECT:	**EFFECTIVE STIFFNESS OF SECTION**		

Interior wall - 20" Pipe

Pipe O.D	20 in
Pipe t	0.625 in
Pipe I.D	18.75 in
Geometry	
Corrosion Reduction	0.062 in
Pipe O.D	19.876 in
Pipe t	0.563 in
Moment of Inertia	
Pipe	1594 in^4
	956 in^4/ft
Modulus of elasticity E	
Sheet Pile	29000 ksi

Core steel 0

Moment of Inertia	0 in4
	0 in4/ft
E	29000 ksi

Concrete

Moment of Inertia	6067 in4
E	4000 ksi
n=	7.25
Transformed I	837 in4
	502 in4/ft

Composite section

Moment of inertia	1458 in4/ft
S avail.	147 in3/ft
Effective Stiffness of Composite Section	
EIeff	42296311 k-in2/ft
	293724 k-ft^2/ft

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC/SK Date: 3/18/2019

FOR First Street Turning Basin

Checked By: SK/AA Date: 3/18/2019

SUBJECT: **SOE STAGING SUMMARY : INTERIOR RETAINING WALL (20.5" DIA. INTERLOCKED PIPE PILES) FOR INTERTIDAL VEGETATIVE SHELF**

	SECTION / STAGE	Brace Reaction	Maximum Wall Moment	Maximum Wall Shear	Subgrade Elevation	Embedment Depth below Subgrade	Minimum Pile Tip Elevation	Max. Deflection	Notes
		-	M_{max}	V_{max}		FS = 1.2	FS = 1.2		
		k/ft	k*ft/ft	k/ft	El.	ft	El.	in	in
Interior Wall 20"x0.625"	**Case 1** **Wall moves South :**Temporary Brace @ EL. +1	5.3	47.6	5.2	-21.5	11.5	-33.0	0.3	600psf surcharge
	Case 2 **Wall moves North :** Subjected to temporary bracing reaction from South using soil spring stiffness	-	388.0	73.6	-3.07	-		1.9 AT EL 2.0	No surcharge; Temporary bracing 12.7kip/ft/ft
	Case 3 **Service Codition:** Contribution to driving forces on interior wall including resistance to passive pressures from North wall	18.1	37.2	9.9	-18.5	5.4	-23.9	0.1	Service loading 600 PSF Surcharge
	Case 4 **Liquefaction case:** Contribution to driving forces on interior wall without resistance to passive pressures from North wall	15.4	197.4	18.8	-18.5	44.0	-62.5	1.96 AT EL. -40.7 1.72 AT TOP OF WALL	No surcharge FS:1
	Case 5 **Liquefaction case:** Contribution to driving forces on interior wall including resistance to passive pressures from North wall	27.4	161.7	17.0	-18.5	42.8	-61.3	1.4	No surcharge FS:1

*Maximum deflection in each stage occurs at top of wall unless otherwise noted.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC/SK Date: 3/18/2019

FOR First Street Turning Basin

Checked By: SK/AA Date: 3/18/2019

SUBJECT: **SOE STAGING SUMMARY : INTERIOR RETAINING WALL (20.5" DIA. INTERLOCKED PIPE PILES) FOR INTERTIDAL VEGETATIVE SHELF**

	Check				
	fy	50	ksi		
	Max M	388.0	k-ft		
	Max V	73.6	k/ft		
Reqd S	M/0.66fy	141.09	in^3/ft	(Static)	Int Wall
	20"x0.625" pipe				
	S available	147.0	in^3/ft	OK	
	Stress (static)	31.7	ksi		
Shear:	Shear area available	19	in^2/ft		
	Shear area reqd	3.68	in^2/ft	OK	

SHEET ___ OF ___

MUESER RUTLEDGE CONSULTING ENGINEERS

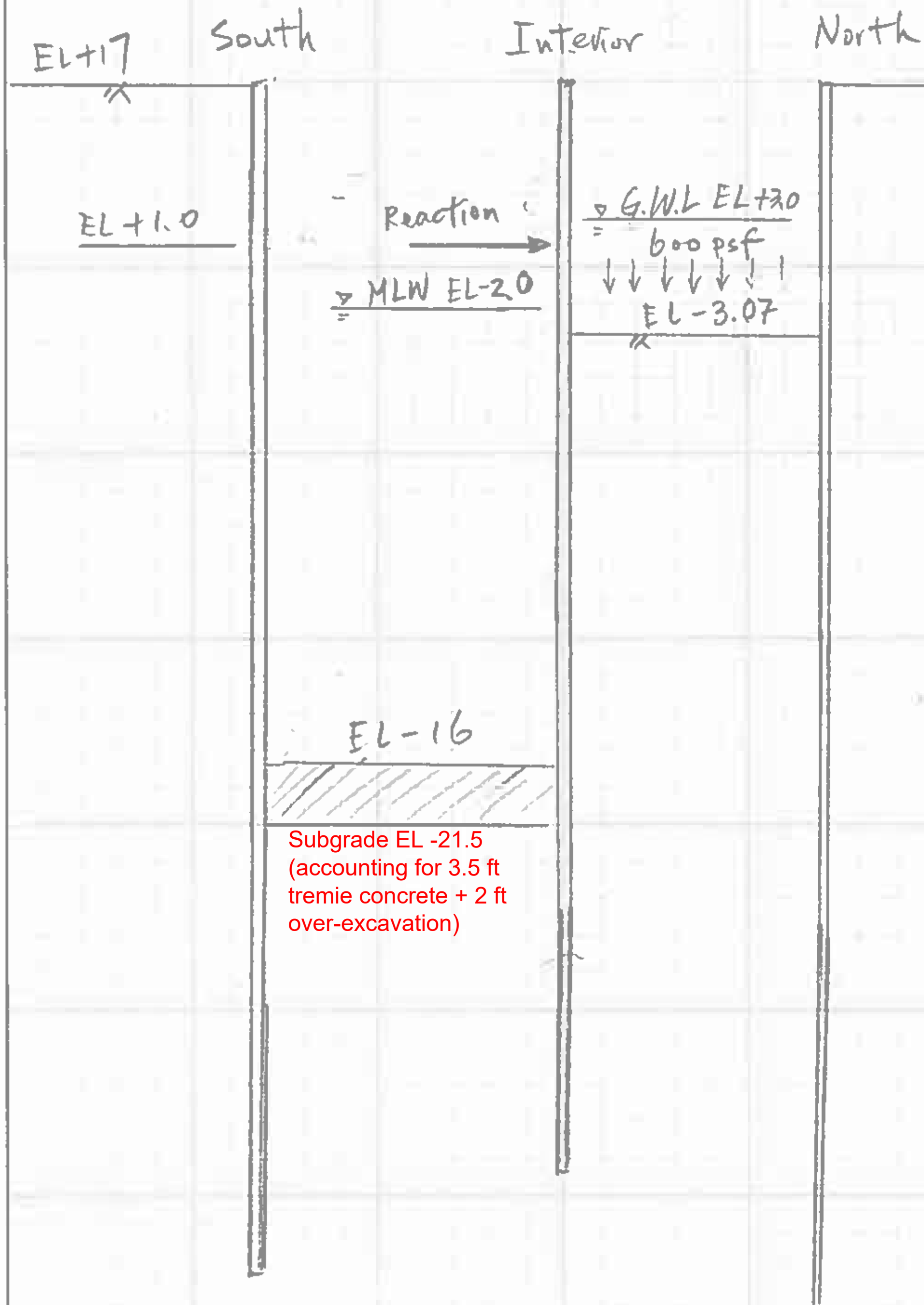
FILE ___

PROJECT 12541

MADE BY TC DATE 11/08/18

CHECKED BY SK DATE 11/9/18

SUBJECT Interior Wall staging - Case 1



\+ 600 psf surcharge

* Assume anchored at EL +1.0

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: TC/SK Date: 3/18/2019
Checked By: Date: 3/18/2019

FOR First Street Turning Basin

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 1** **case 1**

Lateral Earth Pressures: Interior Wall Moves Towards South with 600psf surcharge

Refer to Section-B on SOE-300 and SOE-400.

DRIVING FORCES											RESISTING FORCES								
Layer [1]	Elev	H	γ	σ_v	k_a	c	R_a	Active Pressure	600psf construction surcharge	Water Pressure	H	γ	σ_v	k_p	R_p	c	Passive Pressure	Net Pressure	Elev
	[ft]	[ft]	[pcf]	[psf]		[psf]		[psf]	(psf)	(psf)	[ft]	[pcf]	[psf]		[psf]	[psf]	[psf]	[psf]	[ft]
	17	0	0	0	0.333		1.00	0		0								0	17.00
	4	13	0	0	0.333		1.00	0		0								0	4.00
	4	0	0	0	0.333		1.00	0		0								0	4.00
	2	2	0	0	0.333		1.00	0		125								125	2.00
	2	0	0	0	0.333		1.00	0		125								125	2.00
	-3	5	0	0	0.333		1.00	0		125								125	-3.00
F	-3	0	0	0	0.333		1.00	0		125								125	-3.00
	-3.07	0.07	57.6	4	0.333		1.00	1	0	125								126	-3.07
	-3.07	0	57.6	4	0.333		1.00	1	240	125								366	-3.07
	-13.07	10	57.6	580	0.333		1.00	193	240	125								558	-13.07
	-13.07	0	57.6	580	0.333		1.00	193	100	125								418	-13.07
	-19	5.93	57.6	922	0.333		1.00	307	100	125								532	-19.00
	-19	0	62.6	922	0.307		1.00	283	100	125								508	-19.00
	-21.5	2.5	62.6	1078	0.307		1.00	331	100	125								556	-21.50
	-21.5	0	62.6	1078	0.307		1.00	331	100	125	0	62.6	0	3.3	1.00		0	556	-21.50
S	-23.07	1.57	62.6	1176	0.307		1.00	361	100	125	1.57	62.6	98.28	3.3	1.00		-320	266	-23.07
	-23.07	0	62.6	1176	0.307		1.00	361	0	125	0	62.6	98.28	3.3	1.00		-320	166	-23.07
	-30	6.93	62.6	1610	0.307		1.00	495		125	6.93	62.6	532.1	3.3	1.00		-1732	-1112	-30.00
	-30	0	62.6	1610	0.307		1.00	495		125	0	62.6	532.1	3.3	1.00		-1732	-1112	-30.00
	-60	30	62.6	3488	0.307		1.00	1072		125	30	62.6	2410	3.3	1.00		-7844	-6647	-60.00

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

1 Coefficient of active and passive earth pressure based on Rankine Theory.

2 Subgrade at EL-16

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

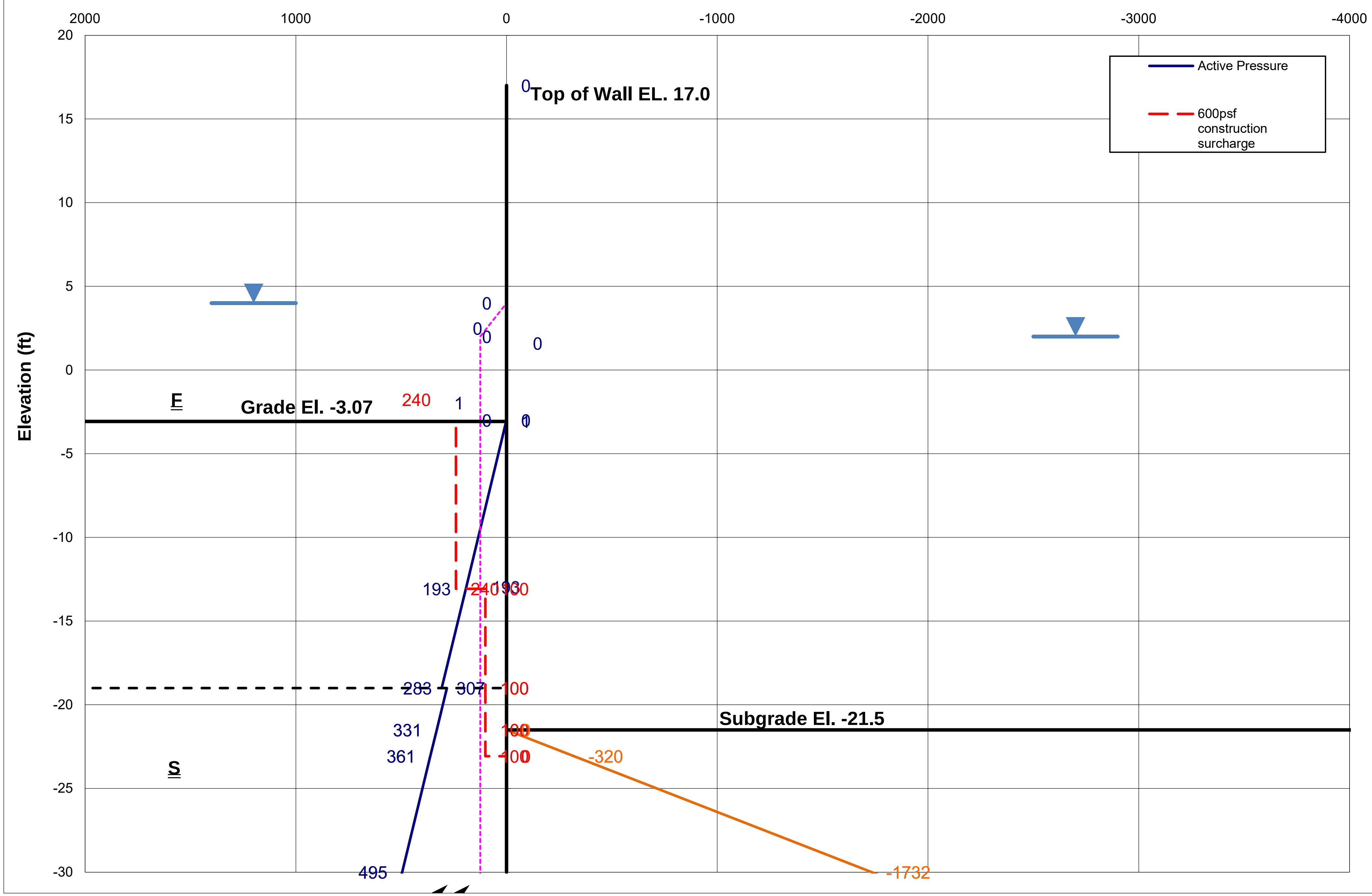
Made By: TC/ SK   Date: 3/18/2019

FOR First Street Turning Basin   Checked By: Date: 3/18/2019

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 1**   **case 1**

Lateral Pressures

Pressures (psf)

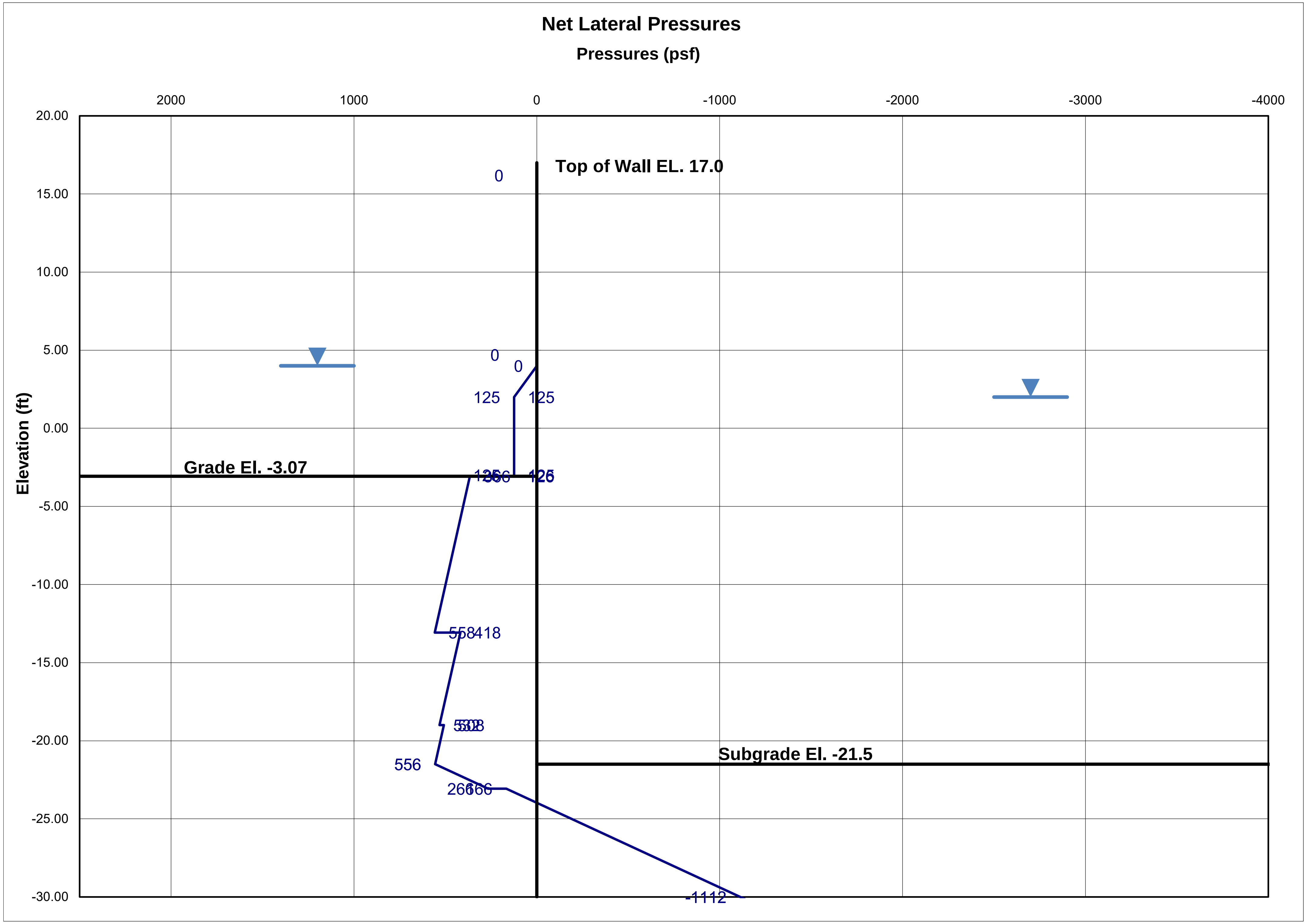


MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: TC/ SK Date: 3/18/2019
Checked By: Date: 3/18/2019

FOR First Street Turning Basin

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 1** **case 1**



MUESER RUTLEDGE CONSULTING ENGINEERS

INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF.

Anchored Wall Analysis V2.1 for Windows

Subject: Case 1: Wall moves south (Temporary brace at EL. +1.0)
Refer to Section-B on SOE-300 and SOE-400.

FREE EARTH METHOD
For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.000	0.000	13.00
0.000	0.125	7.00
0.125	0.126	0.07
0.366	0.558	10.00
0.418	0.532	5.93
0.508	0.556	2.50
0.556	0.266	1.57

Pressure at slope (ksf): -0.166
Pressure slope (ksf/ft): 0.184

Flexural rigidity of wall [EI] (k-ft^2): 293724

Distance from top of wall to anchor (ft): 16

Results from analysis:

d = 9.57 ft embedment below z = 38.50
with FS=1.0

Total wall length = 48.07 ft

Anchor Pull = 5.30 k/ft
Moment at anchor = 0.08 k-ft/ft
Shear at anchor = 5.22 k/ft

Maximum positive moment = 47.60 k-ft/ft

Maximum moment = 47.60 k-ft/ft
Location of maximum moment = 30.62 ft below top of wall

Maximum shear = 5.22 k/ft

Maximum load = -1.31 ksf/ft
Maximum defl. = 0.32 in at 0.00 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.00	0.00	0.00	0.32
2.40	0.00	0.00	0.00	0.27
4.81	0.00	0.00	0.00	0.22
7.21	0.00	0.00	0.00	0.18
9.61	0.00	0.00	0.00	0.13
12.02	0.00	0.00	0.00	0.08
14.42	0.03	0.02	-0.01	0.03
16.82	0.07	-5.17	4.20	-0.02
19.23	0.11	-4.95	16.38	-0.06
21.63	0.40	-4.26	27.63	-0.11
24.04	0.44	-3.25	36.67	-0.14
26.44	0.49	-2.13	43.16	-0.17
28.84	0.53	-0.90	46.83	-0.19
31.25	0.44	0.27	47.51	-0.20
33.65	0.49	1.39	45.54	-0.19
36.05	0.51	2.61	40.75	-0.18
38.46	0.56	3.89	32.96	-0.15
40.86	0.02	4.63	22.44	-0.12
43.26	-0.42	4.15	11.67	-0.08
45.67	-0.86	2.61	3.34	-0.04
48.07	-1.31	0.00	-0.01	0.00

```
                         Pressure     (P/Pmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  2.4                              *
  4.8                              *
  7.2                              *
  9.6                              *
 12.0                              *
 14.4                             *|
 16.8                            * |
 19.2                           *  |
 21.6                     *        |
 24.0                    *         |
 26.4                   *          |
 28.8                  *           |
 31.2                    *         |
 33.6                   *          |
 36.1                  *           |
 38.5                 *            |
 40.9                              *
 43.3                              |         *
 45.7                              |                   *
 48.1                              |                             *
```

```
                           Moment    (M/Mmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                             *
  2.4                             *
  4.8                             *
  7.2                             *
  9.6                             *
 12.0                             *
 14.4                             *
 16.8                             |  *
 19.2                             |         *
 21.6                             |                *
 24.0                             |                      *
 26.4                             |                          *
 28.8                             |                             *
 31.2                             |                             *
 33.6                             |                            *
 36.1                             |                         *
 38.5                             |                    *
 40.9                             |             *
 43.3                             |      *
 45.7                             | *
 48.1                             *


                            Shear    (V/Vmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                             *
  2.4                             *
  4.8                             *
  7.2                             *
  9.6                             *
 12.0                             *
 14.4                             *
 16.8*                            |
 19.2  *                          |
 21.6      *                      |
 24.0           *                 |
 26.4                  *          |
 28.8                         *   |
 31.2                             | *
 33.6                             |       *
 36.1                             |              *
 38.5                             |                     *
 40.9                             |                          *
 43.3                             |                       *
 45.7                             |              *
 48.1                             *
```

```
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              |                             *
  2.4                              |                        *
  4.8                              |                    *
  7.2                              |               *
  9.6                              |           *
 12.0                              |      *
 14.4                              |  *
 16.8                            * |
 19.2                        *     |
 21.6                    *         |
 24.0                 *            |
 26.4              *               |
 28.8            *                 |
 31.2           *                  |
 33.6            *                 |
 36.1             *                |
 38.5                *             |
 40.9                   *          |
 43.3                      *       |
 45.7                          *   |
 48.1                              *
```

MUESER RUTLEDGE CONSULTING ENGINEERS

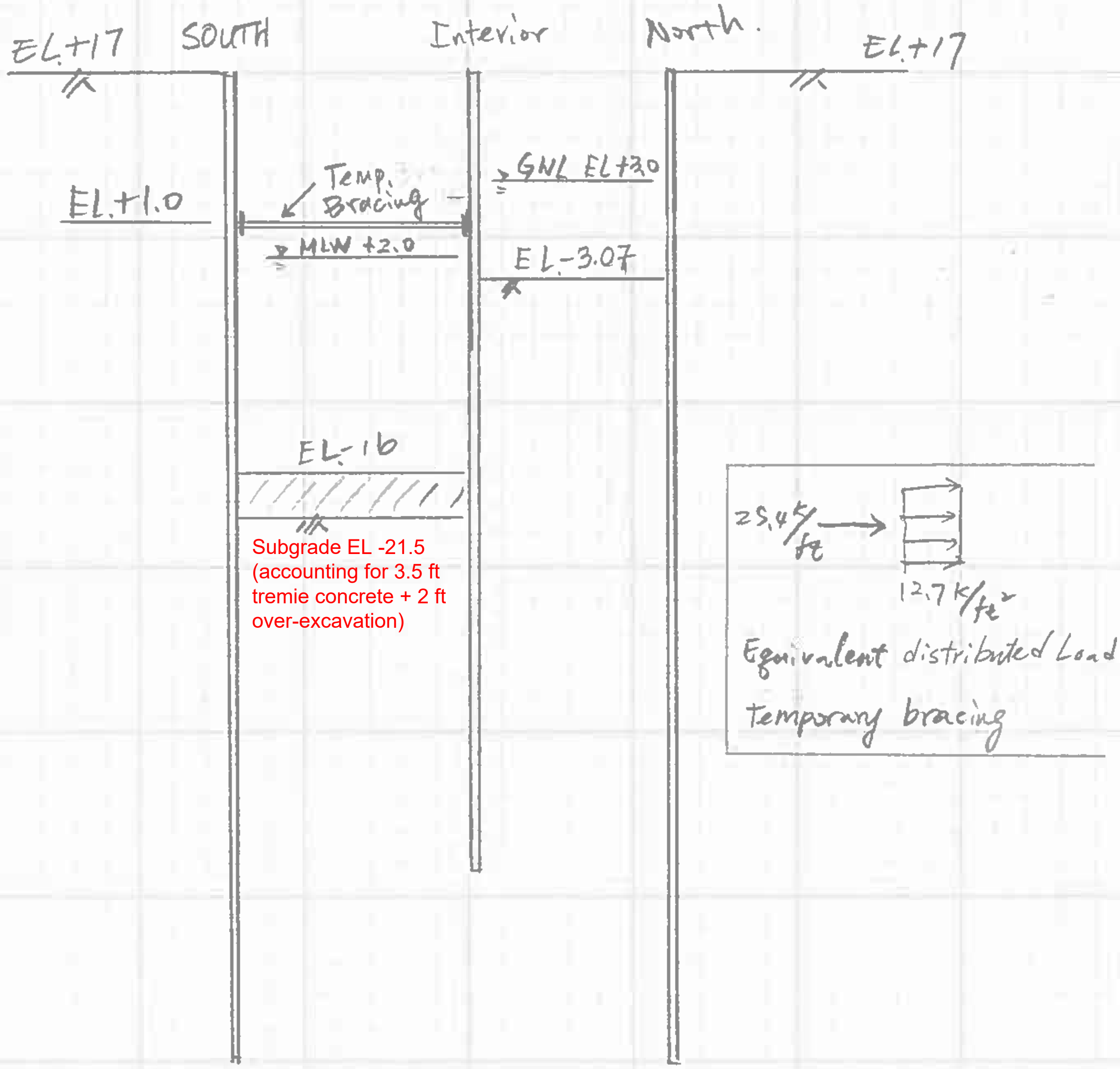
FILE

MADE BY TC DATE 11/08/18

CHECKED BY SK DATE 11/12/18

PROJECT 12541

SUBJECT Interior wall staging - Case 2



Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541
Made By: SK Date: 3/13/2019
FOR First Street Turning Basin Checked By: Date: 3/13/2019

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 2** **case 2**

Lateral Earth Pressures: Interior Wall subjected to temporary bracing reaction Refer to Section-B on SOE-300 and SOE-400.

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	600psf construction surcharge (psf)	Temporary bracing effect (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	17	0	0	0	0.333		1.00	0										0	17.00
	2	15	0	0	0.333		1.00	0		0								0	2.00
	2	0	0	0	0.333		1.00	0		12700								12700	2.00
	1	1	0	0	0.333		1.00	0		12700								12700	1.00
	1	0	0	0	0.333		1.00	0		12700								12700	1.00
	0	1	0	0	0.333		1.00	0		12700								12700	0.00
	0	0	0	0	0.333		1.00	0		0								0	0.00
	-3.07	3.07	0	0	0.333		1.00	0										0	-3.07
	-3.07	0	0	0	0.333		1.00	0			0	57.6	0.0	3.0	1.00		0	0	-3.07
	-16	12.93	0	0	0.333		1.00	0			12.93	57.6	744.8	3.0	1.00		-2234	-2234	-16.00
	-16	0	0	0	0.333		1.00	0			0	57.6	744.8	3.0	1.00		-2234	-2234	-16.00
	-19	3	0	0	0.333		1.00	0			3	57.6	917.6	3.0	1.00		-2753	-2753	-19.00
S	-19	0	0	0	0.307		1.00	0			0	62.6	917.6	3.3	1.00		-2986	-2986	-19.00
	-21.5	2.5	0	0	0.307		1.00	0			2.5	62.6	1074	3.3	1.00		-3496	-3496	-21.50
	-21.5	0	62.6	0	0.307		1.00	0			0	62.6	1074	3.3	1.00		-3496	-3496	-21.50
	-35	13.5	62.6	845	0.307		1.00	260			13.5	62.6	1919	3.3	1.00		-6246	-5986.4	-35.00

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade at EL-3.07

* Temporary bracing effect accounts for 25.4 klf from South wall distributed over 2 ft length.

Sheet No. _______ of _______

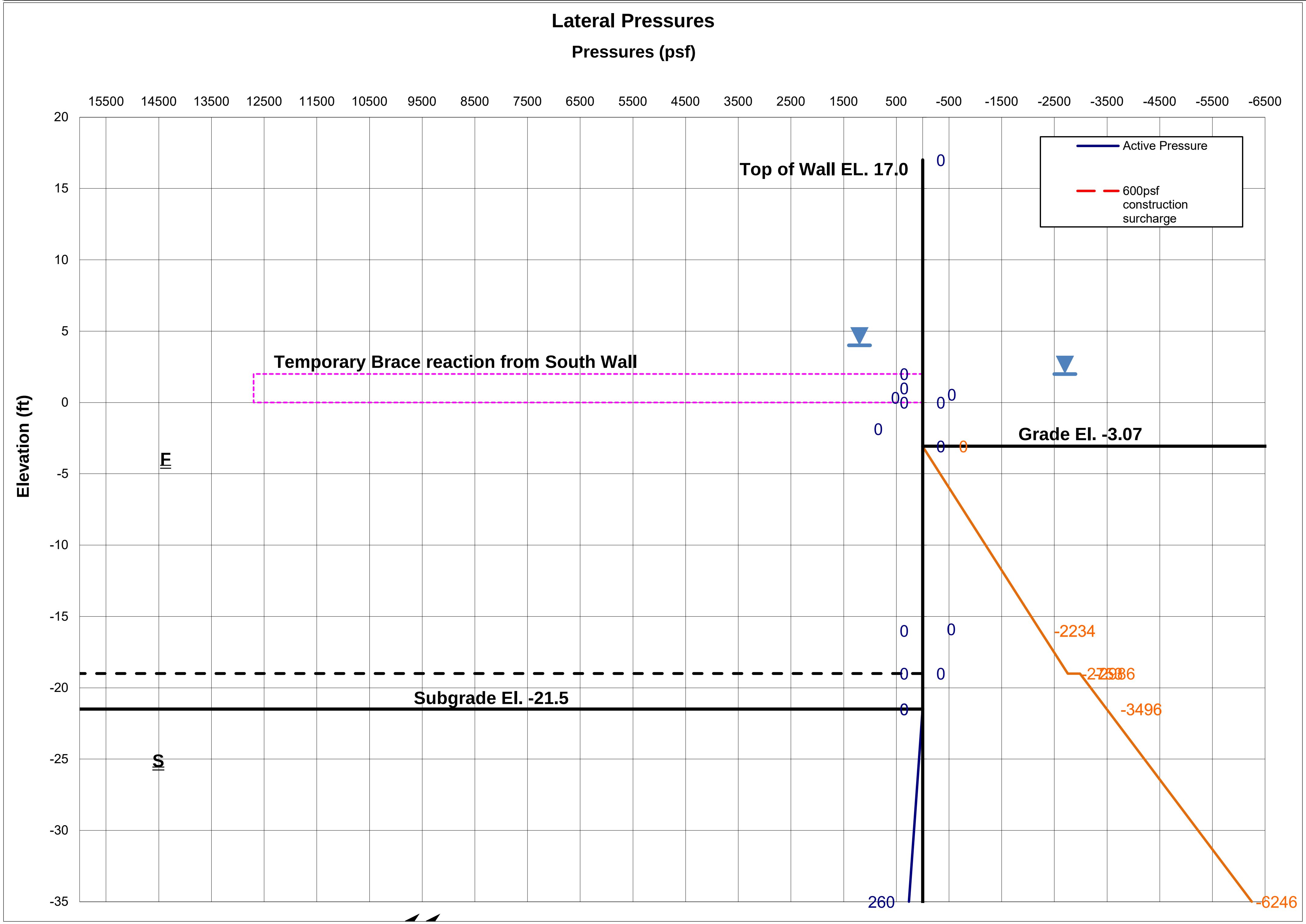
MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/13/2019

FOR First Street Turning Basin Checked By: Date: 3/13/2019

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 2** **case 2**



Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/13/2019

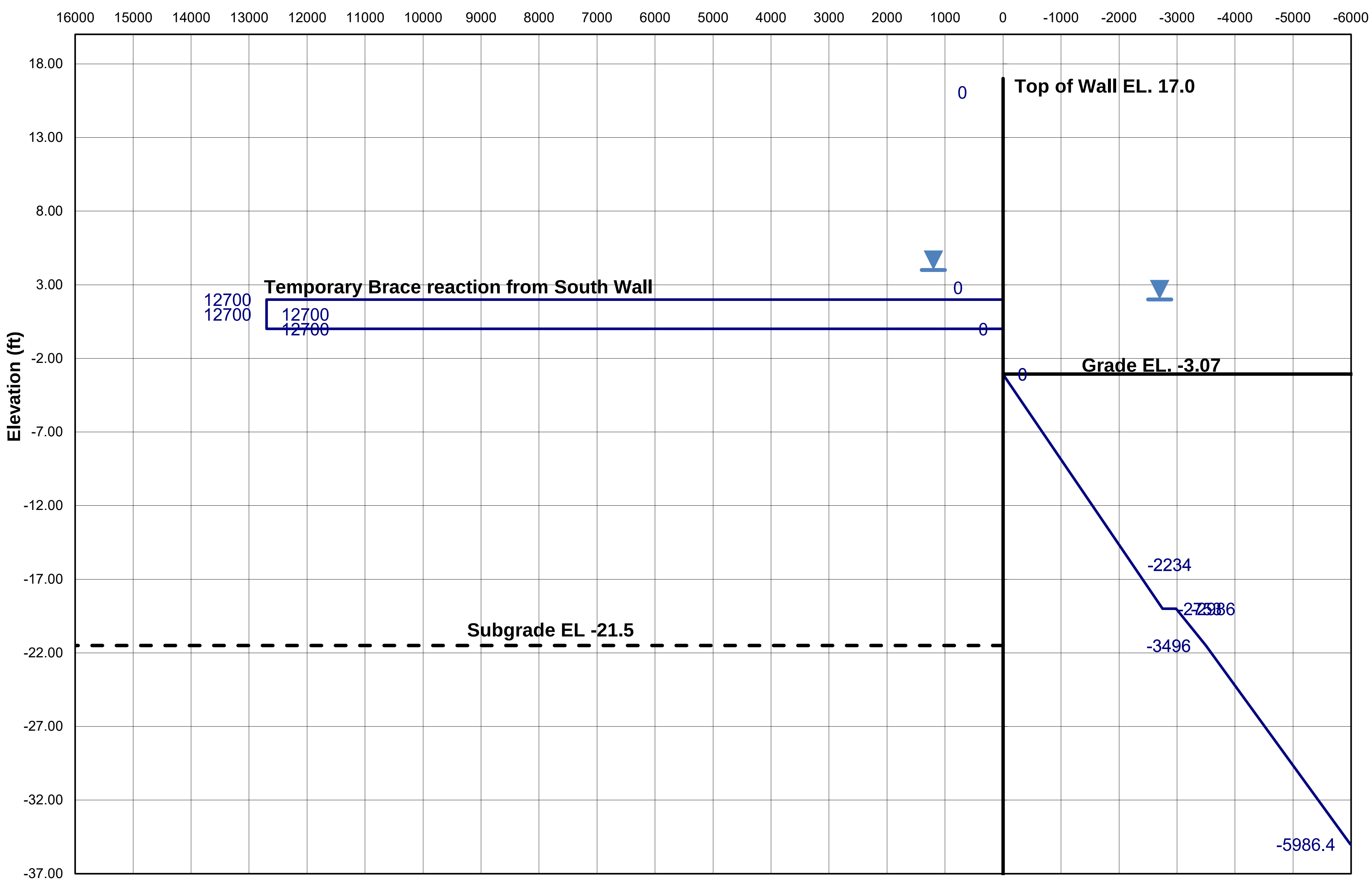
Checked By: Date: 3/13/2019

FOR First Street Turning Basin

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 2** **case 2**

Net Lateral Pressures

Pressures (psf)



MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. of __ __
File: 12541
Made By: SK Date: 3/12/2019
Checked By: Date:

FOR: FIRST ST TURNING BASIN

SUBJECT: INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. CASE 2B-SOIL SPRING STIFFNESS

SPRING STIFFNESS FOR PIPE PILE

STRATA	ELEVATION	BUOYANT UNIT WEIGHT	LATERAL SUBGRADE MODIFICATION FACTOR	VERTICAL PRESSURE	NORMALIZED DEPTH	LATERAL SUBGRADE MODULUS	WIDTH OF WALL	f*z/d	TRIBUTARY AREA	RED. FACTOR	SOIL SPRING	AVERAGE
	EL	γ_b	f	σ_v	σ_v / γ_b	f*z	d	kh	ΔEL*d	RF	k=kh*A*RF	
	(FT)	(PSF)	(KCF)	(KSF)	(FT) - z	(KSF)	(FT)	(KCF)	A (SF)		(kip/in)	
	-3.07	57.6	20	0	0.0000	0.0000	1	0.0000	0.5	1	0.0288	
	-4	57.6	20	0.0576	1.0000	20.0000	1	20.0000	1	1	1.6667	
	-5	57.6	20	0.1152	2.0000	40.0000	1	40.0000	1	1	3.3333	
	-6	57.6	20	0.1728	3.0000	60.0000	1	60.0000	1	1	5.0000	
	-7	57.6	20	0.2304	4.0000	80.0000	1	80.0000	1	1	6.6667	
	-8	57.6	20	0.288	5.0000	100.0000	1	100.0000	1	1	8.3333	
	-9	57.6	20	0.3456	6.0000	120.0000	1	120.0000	1	1	10.0000	
	-10	57.6	20	0.4032	7.0000	140.0000	1	140.0000	1	1	11.6667	
F	-11	57.6	20	0.4608	8.0000	160.0000	1	160.0000	1	1	13.3333	
	-12	57.6	20	0.5184	9.0000	180.0000	1	180.0000	1	1	15.0000	
	-13	57.6	20	0.576	10.0000	200.0000	1	200.0000	1	1	16.6667	
	-14	57.6	20	0.6336	11.0000	220.0000	1	220.0000	1	1	18.3333	
	-15	57.6	20	0.6912	12.0000	240.0000	1	240.0000	1	1	20.0000	
	-16	57.6	20	0.7488	13.0000	260.0000	1	260.0000	1	1	21.6667	
	-17	57.6	20	0.8064	14.0000	280.0000	1	280.0000	1	1	23.3333	
	-18	57.6	20	0.864	15.0000	300.0000	1	300.0000	1	1	25.0000	38.935
	-19	57.6	20	0.9216	16.0000	320.0000	1	320.0000	1	1	26.6667	
	-19	62.6	20	0.9216	14.7220	294.4409	1	294.4409	1	1	24.5367	
	-20	62.6	20	0.9842	15.7220	314.4409	1	314.4409	1	1	26.2034	
	-21	62.6	20	1.0468	16.7220	334.4409	1	334.4409	1	1	27.8701	
	-22	62.6	20	1.1094	17.7220	354.4409	1	354.4409	1	1	29.5367	
	-23	62.6	20	1.172	18.7220	374.4409	1	374.4409	1	1	31.2034	
	-24	62.6	20	1.2346	19.7220	394.4409	1	394.4409	1	1	32.8701	
	-25	62.6	20	1.2972	20.7220	414.4409	1	414.4409	1	1	34.5367	
	-26	62.6	20	1.3598	21.7220	434.4409	1	434.4409	1	1	36.2034	
S	-27	62.6	20	1.4224	22.7220	454.4409	1	454.4409	1	1	37.8701	
	-28	62.6	20	1.485	23.7220	474.4409	1	474.4409	1	1	39.5367	
	-29	62.6	20	1.5476	24.7220	494.4409	1	494.4409	1	1	41.2034	
	-30	62.6	20	1.6102	25.7220	514.4409	1	514.4409	1	1	42.8701	
	-31	62.6	20	1.6728	26.7220	534.4409	1	534.4409	1	1	44.5367	
	-32	62.6	20	1.7354	27.7220	554.4409	1	554.4409	1	1	46.2034	
	-33	62.6	20	1.798	28.7220	574.4409	1	574.4409	1	1	47.8701	
	-34	62.6	20	1.8606	29.7220	594.4409	1	594.4409	1	1	49.5367	
	-35	62.6	20	1.9232	30.7220	614.4409	1	614.4409	1	1	51.2034	

Case 2: Interior wall moves north subjected to temporary bracing reaction from south wall using *soil spring stiffness starting from EL -3.07.* Refer to Section-B on SOE-300 and SOE-400.

Sheet No. of __ __

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/12/2019

FOR: FIRST ST TURNING BASIN Checked By: Date:

SUBJECT: INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. CASE 2B-SOIL SPRING STIFFNESS

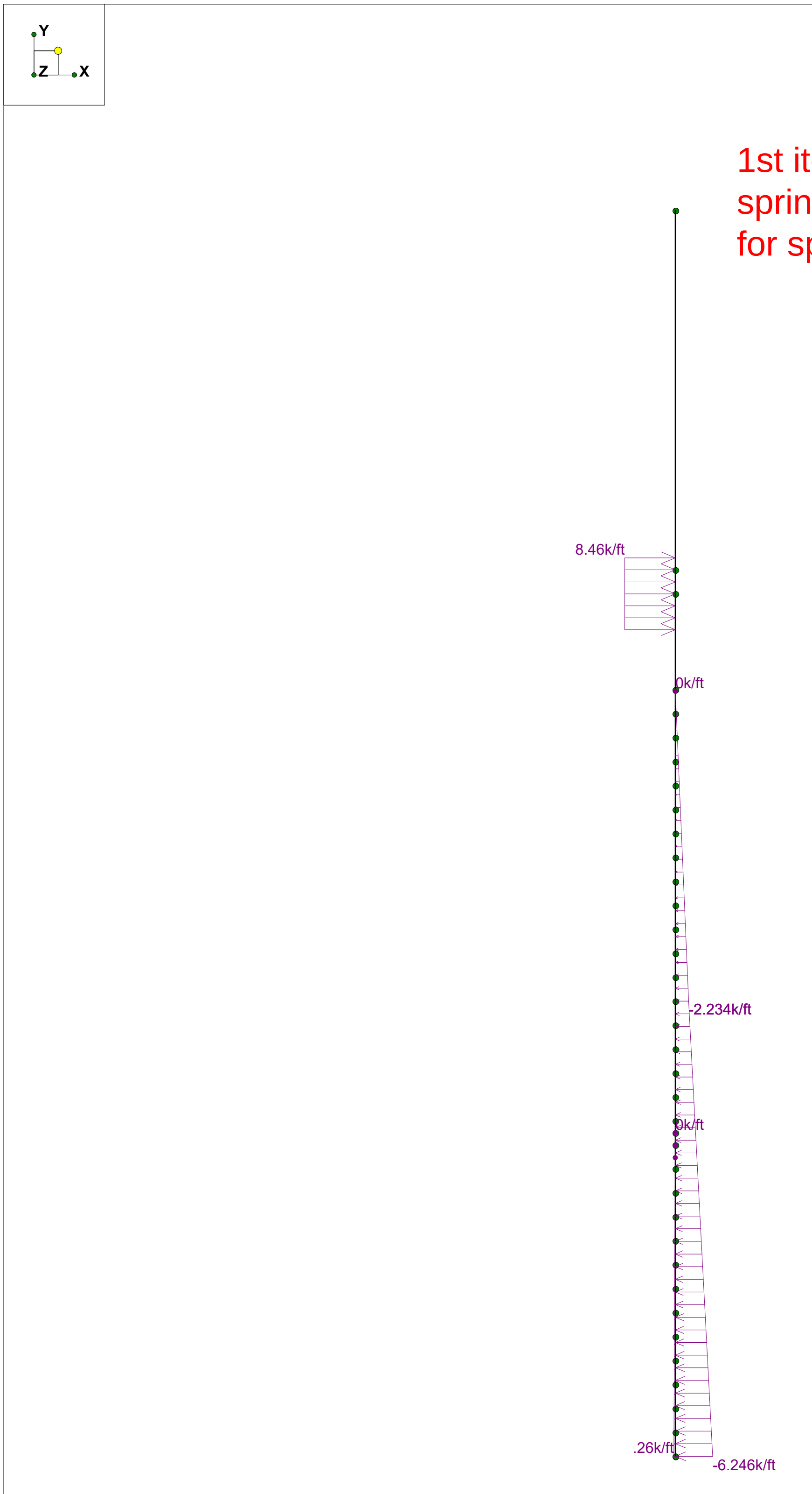
STRATA	ELEVATION	BUOYANT UNIT WEIGHT	VERTICAL PRESSURE	Kp	PASSIVE PRESSURE		WIDTH OF WALL	RED. FACTOR	SPRING LIMIT	AVERAGE
	EL	γ_b	σ_v		σ_v*k_p		d	RF	d*Kp*RF*σv	
	(FT)	(PSF)	(KSF)		(KSF)		(FT)		(kips)	
F	-3	57.6	0	1	0		1	1	0.086	
	-4	57.6	0.0576	3	0.1728		1	1	0.173	
	-5	57.6	0.1152	3	0.3456		1	1	0.346	
	-6	57.6	0.1728	3	0.5184		1	1	0.518	
	-7	57.6	0.2304	3	0.6912		1	1	0.691	
	-8	57.6	0.288	3	0.864		1	1	0.864	
	-9	57.6	0.3456	3	1.0368		1	1	1.037	
	-10	57.6	0.4032	3	1.2096		1	1	1.210	
	-11	57.6	0.4608	3	1.3824		1	1	1.382	
	-12	57.6	0.5184	3	1.5552		1	1	1.555	
	-13	57.6	0.576	3	1.728		1	1	1.728	
	-14	57.6	0.6336	3	1.9008		1	1	1.901	
	-15	57.6	0.6912	3	2.0736		1	1	2.074	
	-16	57.6	0.7488	3	2.2464		1	1	2.246	
	-17	57.6	0.8064	3	2.4192		1	1	2.419	
	-18	57.6	0.864	3	2.592		1	1	2.592	
	-19	57.6	0.9216	3	2.7648	2.90304	1	1	2.765	2.90304
S	-19	62.6	0.9216	3.3	3.04128		1	1	3.041	
	-20	62.6	0.9842	3.3	3.24786		1	1	3.248	
	-21	62.6	1.0468	3.3	3.45444		1	1	3.454	
	-22	62.6	1.1094	3.3	3.66102		1	1	3.661	
	-23	62.6	1.172	3.3	3.8676		1	1	3.868	
	-24	62.6	1.2346	3.3	4.07418		1	1	4.074	
	-25	62.6	1.2972	3.3	4.28076		1	1	4.281	
	-26	62.6	1.3598	3.3	4.48734		1	1	4.487	
	-27	62.6	1.4224	3.3	4.69392		1	1	4.694	
	-28	62.6	1.485	3.3	4.9005		1	1	4.901	
	-29	62.6	1.5476	3.3	5.10708		1	1	5.107	
	-30	62.6	1.6102	3.3	5.31366		1	1	5.314	
	-31	62.6	1.6728	3.3	5.52024		1	1	5.520	
	-32	62.6	1.7354	3.3	5.72682		1	1	5.727	
	-33	62.6	1.798	3.3	5.9334		1	1	5.933	
	-34	62.6	1.8606	3.3	6.13998		1	1	6.140	
	-35	62.6	1.9232	3.3	6.34656		1	1	6.347	

Sheet No. of
MUESER RUTLEDGE CONSULTING ENGINEERS File: 12541
Made By: SK Date: 3/12/2019
FOR: FIRST ST TURNING BASIN Checked By: Date:
SUBJECT: INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. CASE 2B-SOIL SPRING STIFFNESS

Joint Label	Spring Limit (Kip)	1st Iteration Reaction (Kip)	1st Iteration - Spring Limit Check Above Subgrade	2nd Iteration Reaction (Kip)	2nd Iteration - Spring Limit Check Above Subgrade	3rd Iteration Reaction (Kip)	3rd Iteration - Spring Limit Check Above Subgrade	4th Iteration Reaction (Kip)	4th Iteration - Spring Limit Check Above Subgrade
EL.-3	(kips)	-0.03	OK	-0.03	OK	-0.03	OK	-0.03	OK
EL.-4	0.086	-1.521	OK	-1.447	OK	-1.428	OK	-1.425	OK
EL.-5	0.173	-2.577	OK	-2.363	OK	-2.307	OK	-2.298	OK
EL.-6	0.346	-3.204	OK	-2.784	OK	-2.672	OK	-2.655	OK
EL.-7	0.518	-3.444	OK	-2.755	OK	-2.566	OK	-2.539	OK
EL.-8	0.691	-3.347	OK	-2.322	OK	-2.038	OK	-1.998	OK
EL.-9	0.864	-2.963	OK	-1.538	OK	-1.141	OK	-1.086	OK
EL.-10	1.037	-2.347	OK	-0.459	OK	0	OK	0	OK
EL.-11	1.210	-1.551	OK	0	OK	0	OK	0	OK
EL.-12	1.382	-0.628	OK	0	OK	0	OK	0	OK
EL.-13	1.555	0	OK	0	OK	0	OK	0	OK
EL.-14	1.728	0	OK	0	OK	0	OK	0	OK
EL.-15	1.901	0	OK	0	OK	0	OK	0	OK
EL.-16	2.074	0	OK	0	OK	0	OK	0	OK
EL.-17	2.246	0	OK	0	OK	0	OK	0	OK
EL.-18	2.419	0	OK	0	OK	0	OK	0	OK
EL.-19	2.592	0	OK	0	OK	0	OK	0	OK
EL.-20	2.765	0	OK	0	OK	0	OK	0	OK
EL.-21	3.041	5.842	NOT OK	0	OK	0	OK	0	OK
EL.-22	3.248	5.96	NOT OK	0	OK	0	OK	0	OK
EL.-23	3.454	5.937	NOT OK	0	OK	0	OK	0	OK
EL.-24	3.661	5.779	NOT OK	0	OK	0	OK	0	OK
EL.-25	3.868	5.499	NOT OK	0	OK	0	OK	0	OK
EL.-26	4.074	5.107	NOT OK	0	OK	0	OK	0	OK
EL.-27	4.281	4.617	NOT OK	0	OK	0	OK	0	OK
EL.-28	4.487	4.042	OK	9.079	NOT OK	0	OK	0	OK
EL.-29	4.694	3.402	OK	7.475	NOT OK	0	OK	0	OK
EL.-30	4.901	2.717	OK	5.818	NOT OK	0	OK	0	OK
EL.-31	5.107	2.017	OK	4.19	OK	5.472	NOTOK	0	OK
EL.-32	5.314	1.337	OK	2.682	OK	3.527	OK	3.688	OK
EL.-33	5.520	0.729	OK	1.397	OK	1.848	OK	1.939	OK
EL.-34	5.727	0.255	OK	0.455	OK	0.606	OK	0.639	OK
EL.-35	5.933	0	OK	0	OK	0	OK	0	OK

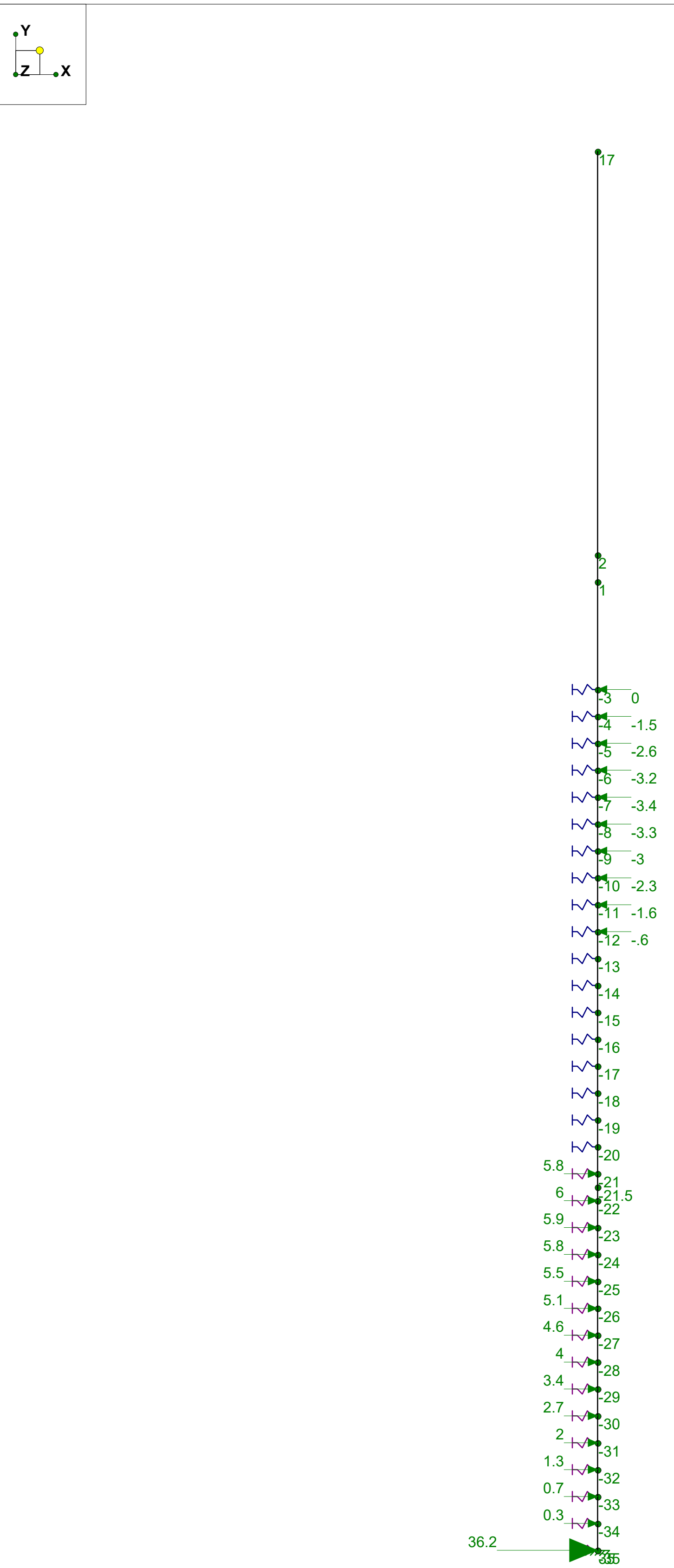
Table showing revised spring limits at each iteration which are in excess of spring limits calculated at each elevation in iterations

1st iteration to determine spring limits (See next sheet for spring stiffness)



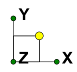
Loads: BLC 1, lateral
Results for LC 1, lateral
Y-direction Reaction Units are k and k-ft

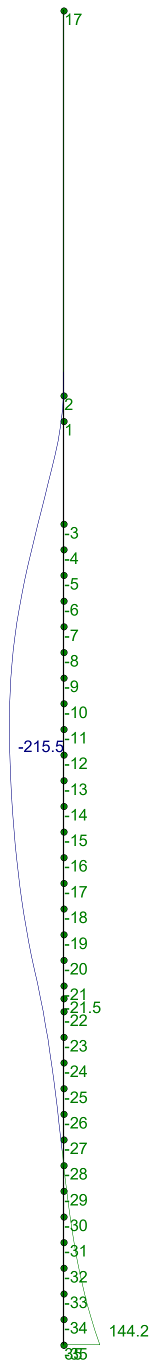
MRCE		CHECKED BY
SK		Mar 15, 2019 at 6:11 PM
12541	LOADING	int wall(case2) - 1st iteration.r2d



Results for LC 1, lateral
X-direction Reaction Units are k and k-ft

MRCE		
SK	FIRST ST TURNING BASIN	Mar 12, 2019 at 6:39 PM
12541	1ST ITERATION - REACTION FOR ANALYSIS	int wall(case2) - 1st iteration.r2d

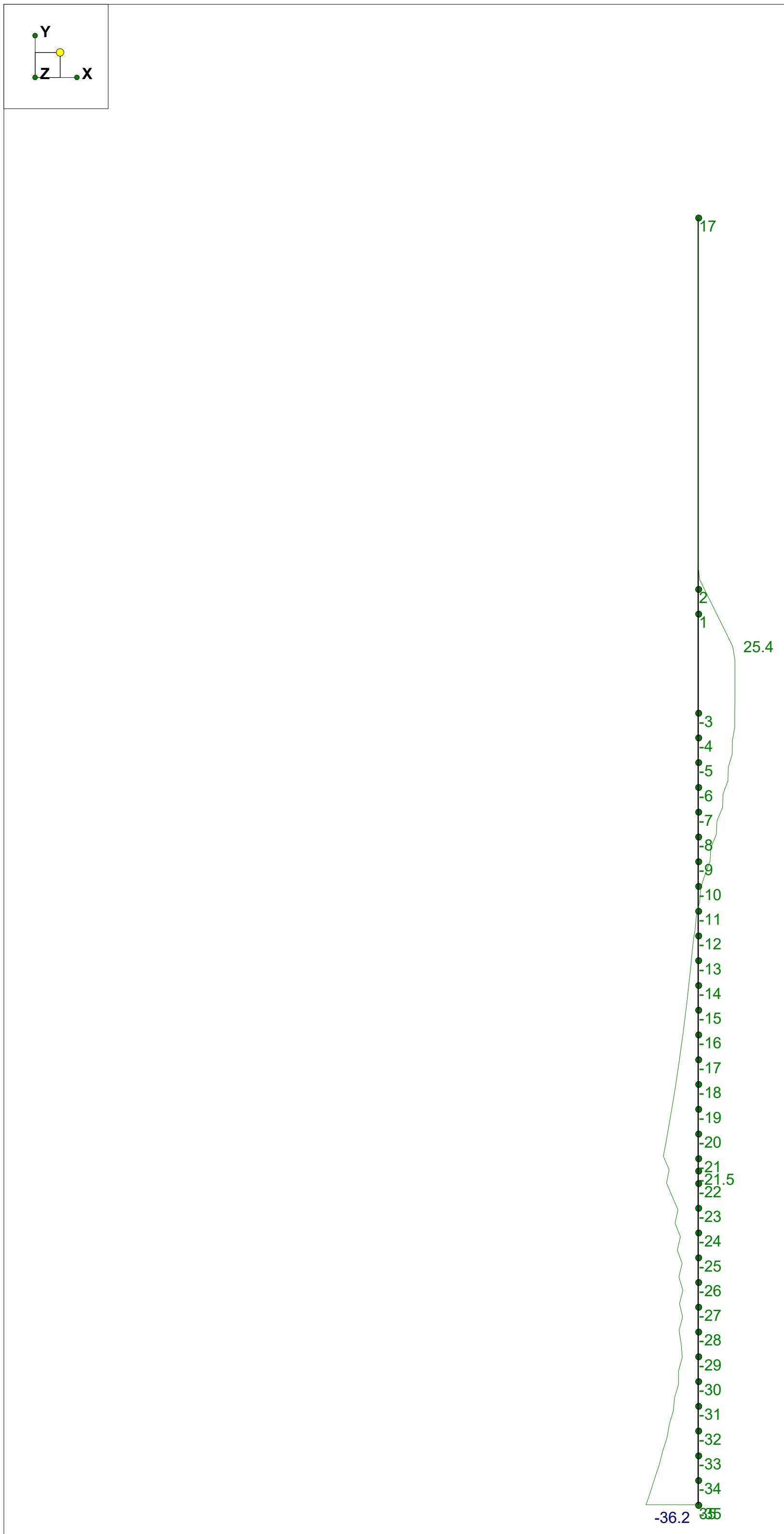




Maximum moment = 215.5 k-ft/ft

Results for LC 1, lateral
Member Bending Moments (k-ft)
Y-direction Reaction Units are k and k-ft

MRCE		CHECKED BY
SK		Mar 15, 2019 at 6:10 PM
12541	MOMENT	int wall(case2) - 1st iteration.r2d



Maximum shear
= 36.2 klf

Results for LC 1, lateral
Member Shear Forces (k)
Y-direction Reaction Units are k and k-ft

MRCE		CHECKED BY
SK		Mar 15, 2019 at 6:10 PM
12541	SHEAR	int wall(case2) - 1st iteration.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	-3	0	-3	0
2	1	0	1	0
3	35	0	-35	0
4	17	0	17	0
5	-21.5	0	-21.5	0
6	2	0	2	0
7	-4	0	-4	0
8	-5	0	-5	0
9	-6	0	-6	0
10	-7	0	-7	0
11	-8	0	-8	0
12	-9	0	-9	0
13	-10	0	-10	0
14	-11	0	-11	0

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Temp [F]
15	-12	0	-12	0
16	-13	0	-13	0
17	-14	0	-14	0
18	-15	0	-15	0
19	-16	0	-16	0
20	-17	0	-17	0
21	-18	0	-18	0
22	-19	0	-19	0
23	-20	0	-20	0
24	-21	0	-21	0
25	-22	0	-22	0
26	-23	0	-23	0
27	-24	0	-24	0
28	-25	0	-25	0
29	-26	0	-26	0
30	-27	0	-27	0
31	-28	0	-28	0
32	-29	0	-29	0
33	-30	0	-30	0
34	-31	0	-31	0
35	-32	0	-32	0
36	-33	0	-33	0
37	-34	0	-34	0
38	-35	0	-35	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	35	Reaction	Reaction	Reaction
2	-3	TS.029		
3	-4	TS1.667		
4	-5	TS3.333		
5	-6	TS5		
6	-7	TS6.667		
7	-8	TS8.333		
8	-9	TS10		
9	-10	TS11.667		
10	-11	TS13.333		
11	-12	TS15		
12	-13	TS16.667		
13	-14	TS18.333		
14	-15	TS20		
15	-16	TS21.667		
16	-17	TS23.333		
17	-18	TS25		
18	-19	TS26.667		
19	-20	TS26.203		
20	-21	S27.87		
21	-22	S29.537		
22	-23	S31.203		
23	-24	S32.87		

Company	: MRCE	Mar 12, 2019
Designer	: SK	6:39 PM
Job Number	: 12541	Checked By:_____
Model Name	: FIRST ST TURNING BASIN	

Joint Boundary Conditions (Continued)

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
24	-25	S34.537		
25	-26	S36.203		
26	-27	S37.87		
27	-28	S39.537		
28	-29	S41.203		
29	-30	S42.87		
30	-31	S44.537		
31	-32	S46.203		
32	-33	S47.87		
33	-34	S49.537		
34	-35	S51.203		

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	17	35		20x0.545	Beam	None	A572 Gr.50	Typical

Member Distributed Loads (BLC 1 : lateral)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	0	.26	38.5	52
2	M1	X	-2.234	-6.246	33	52
3	M1	X	8.46	8.46	14.5	17.5
4	M1	X	0	-2.234	20.07	33

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	lateral	None					4

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	lateral				1	1																		

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	35	36.239	0	-144.162
2	1	-3	-.03	0	0
3	1	-4	-1.521	0	0
4	1	-5	-2.577	0	0
5	1	-6	-3.204	0	0
6	1	-7	-3.444	0	0
7	1	-8	-3.347	0	0
8	1	-9	-2.963	0	0
9	1	-10	-2.347	0	0
10	1	-11	-1.551	0	0
11	1	-12	-.628	0	0

Company : MRCE
Designer : SK
Job Number : 12541
Model Name : FIRST ST TURNING BASIN

Mar 12, 2019
6:39 PM
Checked By:_____

Joint Reactions (Continued)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
12	1	-13	0	0	0
13	1	-14	0	0	0
14	1	-15	0	0	0
15	1	-16	0	0	0
16	1	-17	0	0	0
17	1	-18	0	0	0
18	1	-19	0	0	0
19	1	-20	0	0	0
20	1	-21	5.842	0	0
21	1	-22	5.96	0	0
22	1	-23	5.937	0	0
23	1	-24	5.779	0	0
24	1	-25	5.499	0	0
25	1	-26	5.107	0	0
26	1	-27	4.617	0	0
27	1	-28	4.042	0	0
28	1	-29	3.402	0	0
29	1	-30	2.717	0	0
30	1	-31	2.017	0	0
31	1	-32	1.337	0	0
32	1	-33	.729	0	0
33	1	-34	.255	0	0
34	1	-35	0	0	0
35	1	Totals:	67.868	0	
36	1	COG (ft):	NC	NC	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	0	0
2			2	0	0	0
3			3	0	8.219	-209.853
4			4	0	-22.035	-81.306
5			5	0	-36.239	144.162

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	M1	20x0.545	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...
No Data to Print ...													

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
No Data to Print ...			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	-3	1.059	0	-1.223e-02
2	1	1	1.677	0	-1.305e-02
3	1	35	0	0	0
4	1	17	4.187	0	-1.307e-02
5	1	-21.5	-.206	0	5.516e-04
6	1	2	1.834	0	-1.307e-02
7	1	-4	.913	0	-1.178e-02
8	1	-5	.773	0	-1.124e-02
9	1	-6	.641	0	-1.06e-02
10	1	-7	.517	0	-9.897e-03
11	1	-8	.402	0	-9.131e-03
12	1	-9	.296	0	-8.322e-03
13	1	-10	.201	0	-7.486e-03
14	1	-11	.116	0	-6.639e-03
15	1	-12	.042	0	-5.793e-03
16	1	-13	-.022	0	-4.958e-03
17	1	-14	-.077	0	-4.142e-03
18	1	-15	-.121	0	-3.352e-03
19	1	-16	-.156	0	-2.595e-03
20	1	-17	-.182	0	-1.88e-03
21	1	-18	-.2	0	-1.217e-03
22	1	-19	-.21	0	-6.148e-04
23	1	-20	-.213	0	-8.493e-05
24	1	-21	-.21	0	3.611e-04
25	1	-22	-.202	0	7.221e-04
26	1	-23	-.19	0	1.008e-03
27	1	-24	-.176	0	1.228e-03
28	1	-25	-.159	0	1.391e-03
29	1	-26	-.141	0	1.503e-03
30	1	-27	-.122	0	1.568e-03

Joint Deflections (Continued)

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
31	1	-28	-.102	0	1.589e-03
32	1	-29	-.083	0	1.564e-03
33	1	-30	-.063	0	1.49e-03
34	1	-31	-.045	0	1.359e-03
35	1	-32	-.029	0	1.16e-03
36	1	-33	-.015	0	8.798e-04
37	1	-34	-.005	0	4.999e-04
38	1	-35	0	0	0

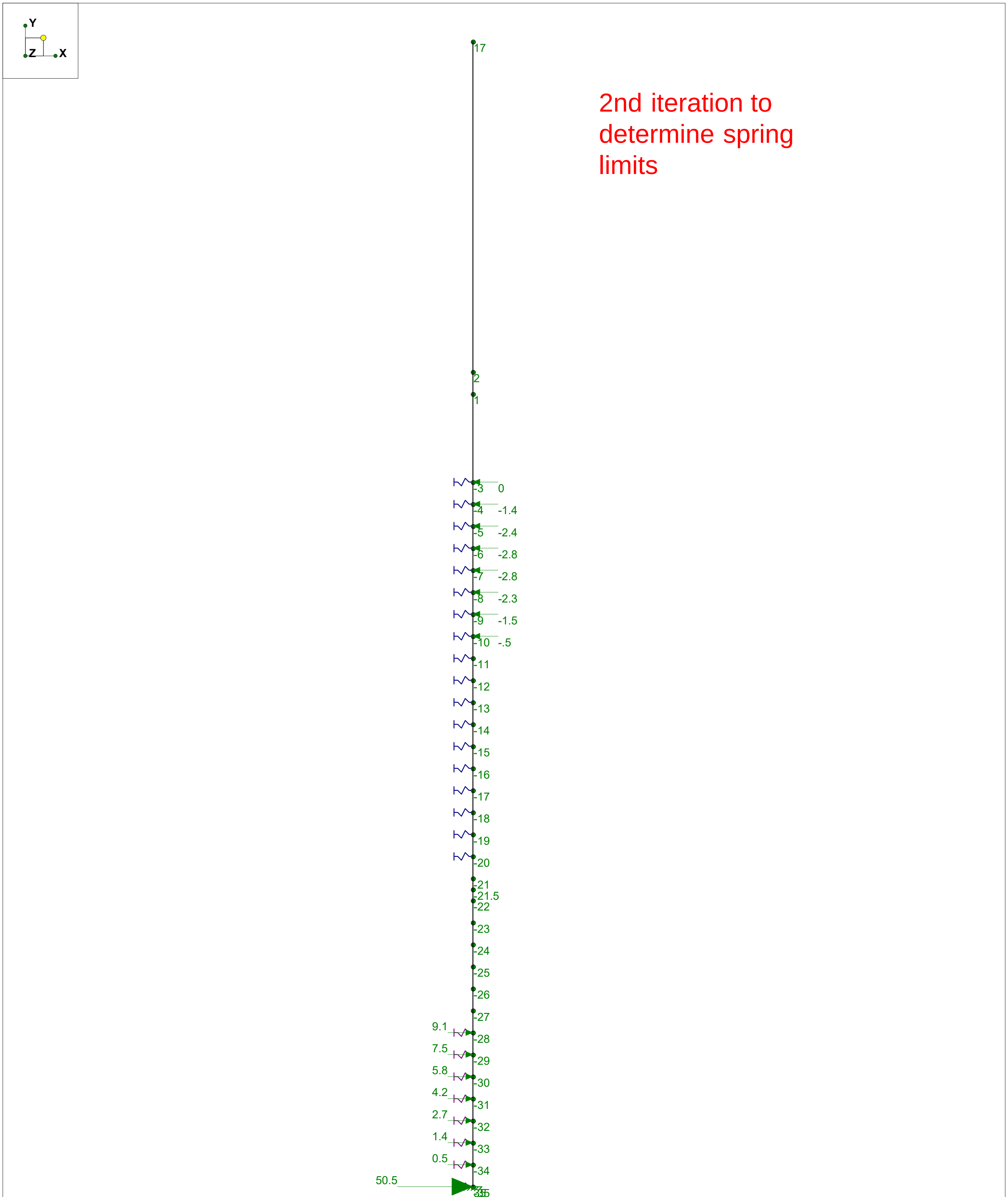
Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	0	0	0
2			J	0	-36.239	144.162

Member Section Stresses

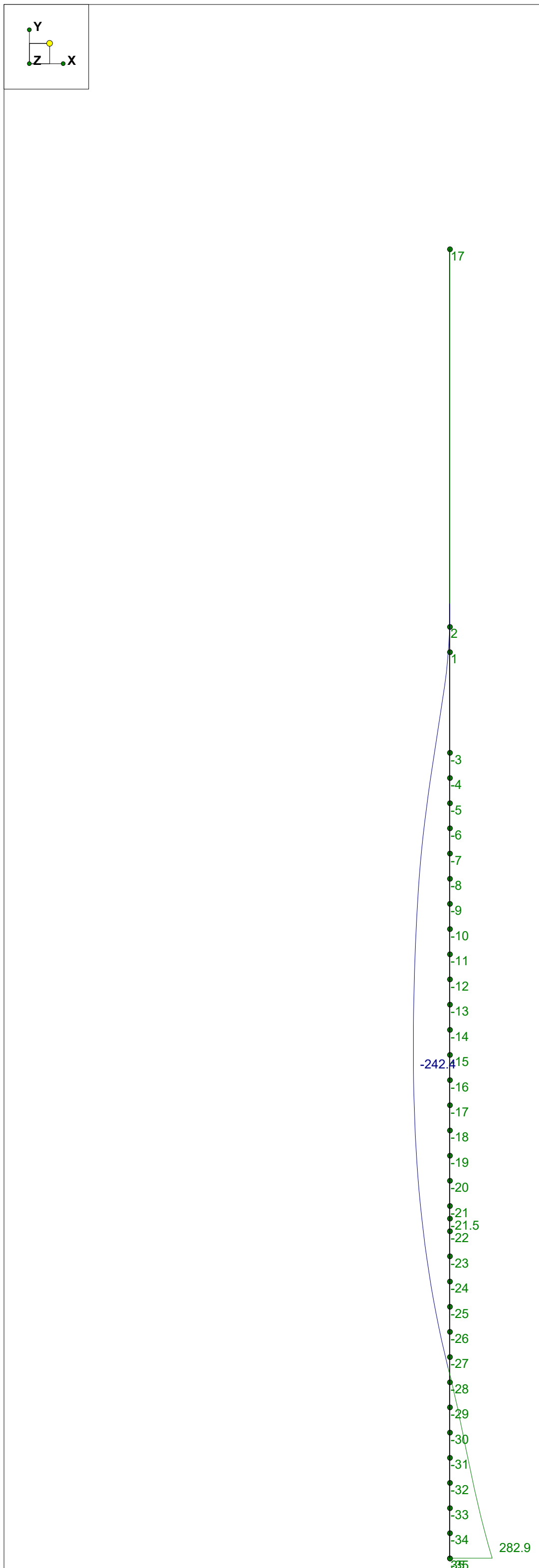
	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	0	0	0	0
2			2	0	0	0	0
3			3	0	.494	15.966	-15.966
4			4	0	-1.323	6.186	-6.186
5			5	0	-2.176	-10.968	10.968

2nd iteration to determine spring limits



Results for LC 1, lateral
X-direction Reaction Units are k and k-ft

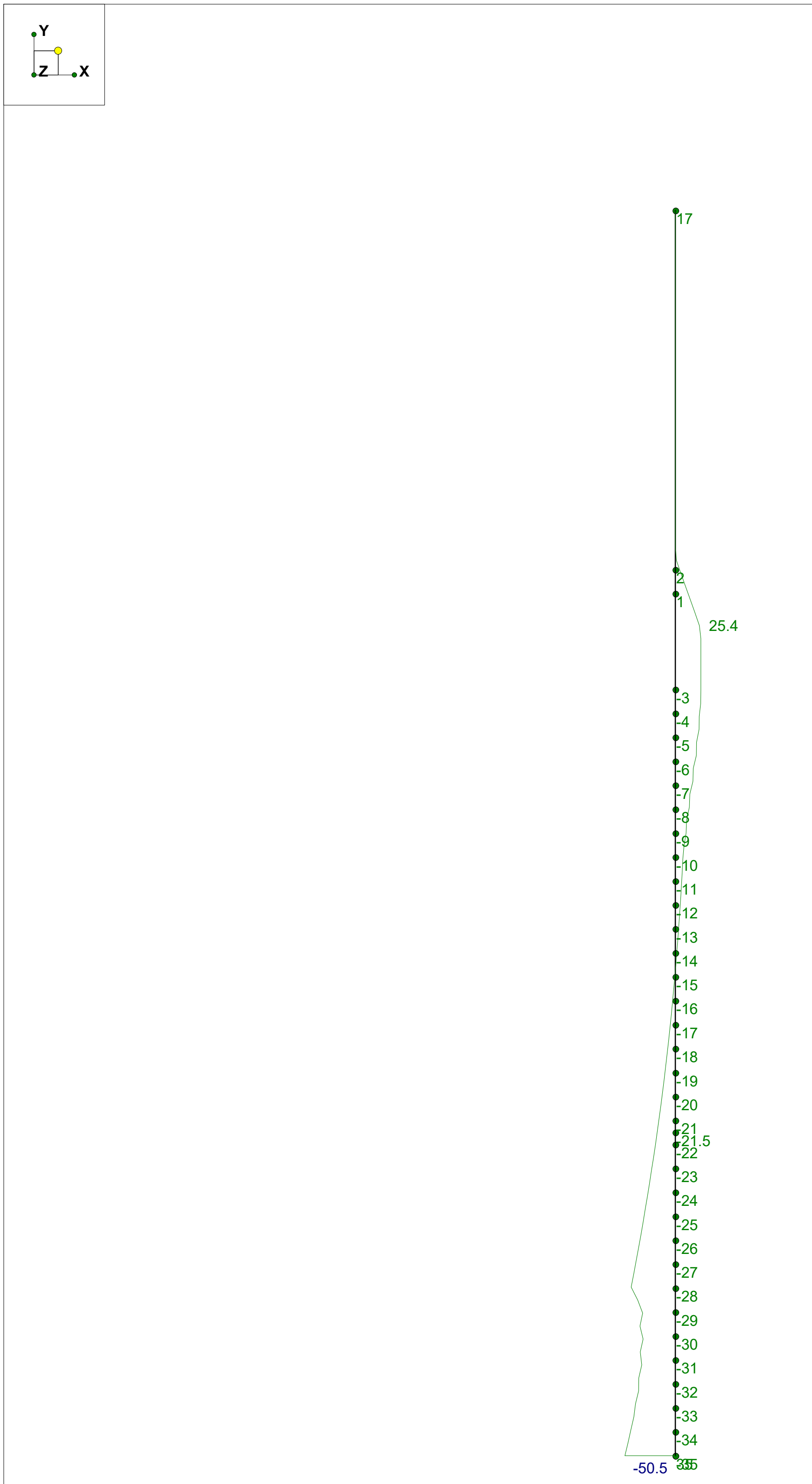
MRCE		SK - 1
SK		Mar 12, 2019 at 6:40 PM
12541	2ND ITERATION - REACTION FOR ANALYSIS	int wall(case2) - 2nd iteration.r2d



Maximum moment = 282.9 k-ft/ft

Results for LC 1, lateral
Member Bending Moments (k-ft)

MRCE		CHECKED BY
SK		Mar 18, 2019 at 8:51 AM
12541	2ND ITERATION MOMENT	int wall(case2) - 2nd iteration.r2d



Maximum shear
= 50.5 klf

Results for LC 1, lateral
Member Shear Forces (k)

MRCE		CHECKED BY
SK		Mar 15, 2019 at 6:12 PM
12541	SHEAR	int wall(case2) - 2nd iteration.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	-3	0	-3	0
2	1	0	1	0
3	35	0	-35	0
4	17	0	17	0
5	-21.5	0	-21.5	0
6	2	0	2	0
7	-4	0	-4	0
8	-5	0	-5	0
9	-6	0	-6	0
10	-7	0	-7	0
11	-8	0	-8	0
12	-9	0	-9	0
13	-10	0	-10	0
14	-11	0	-11	0

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Temp [F]
15	-12	0	-12	0
16	-13	0	-13	0
17	-14	0	-14	0
18	-15	0	-15	0
19	-16	0	-16	0
20	-17	0	-17	0
21	-18	0	-18	0
22	-19	0	-19	0
23	-20	0	-20	0
24	-21	0	-21	0
25	-22	0	-22	0
26	-23	0	-23	0
27	-24	0	-24	0
28	-25	0	-25	0
29	-26	0	-26	0
30	-27	0	-27	0
31	-28	0	-28	0
32	-29	0	-29	0
33	-30	0	-30	0
34	-31	0	-31	0
35	-32	0	-32	0
36	-33	0	-33	0
37	-34	0	-34	0
38	-35	0	-35	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	35	Reaction	Reaction	Reaction
2	-3	TS.029		
3	-4	TS1.667		
4	-5	TS3.333		
5	-6	TS5		
6	-7	TS6.667		
7	-8	TS8.333		
8	-9	TS10		
9	-10	TS11.667		
10	-11	TS13.333		
11	-12	TS15		
12	-13	TS16.667		
13	-14	TS18.333		
14	-15	TS20		
15	-16	TS21.667		
16	-17	TS23.333		
17	-18	TS25		
18	-19	TS26.667		
19	-20	TS26.203		
20	-28	S39.537		
21	-29	S41.203		
22	-30	S42.87		
23	-31	S44.537		

Joint Boundary Conditions (Continued)

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
24	-32	S46.203		
25	-33	S47.87		
26	-34	S49.537		
27	-35	S51.203		

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	17	35		20x0.545	Beam	None	A572 Gr.50	Typical

Member Distributed Loads (BLC 1 : lateral)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	0	.26	38.5	52
2	M1	X	-2.234	-6.246	33	52
3	M1	X	8.46	8.46	14.5	17.5
4	M1	X	0	-2.234	20.07	33

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	lateral	None					4

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	lateral				1	1																		

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	35	50.47	0	-282.88
2	1	-3	-.03	0	0
3	1	-4	-1.447	0	0
4	1	-5	-2.363	0	0
5	1	-6	-2.784	0	0
6	1	-7	-2.755	0	0
7	1	-8	-2.322	0	0
8	1	-9	-1.538	0	0
9	1	-10	-.459	0	0
10	1	-11	0	0	0
11	1	-12	0	0	0
12	1	-13	0	0	0
13	1	-14	0	0	0
14	1	-15	0	0	0
15	1	-16	0	0	0
16	1	-17	0	0	0
17	1	-18	0	0	0
18	1	-19	0	0	0

Joint Reactions (Continued)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
19	1	-20	0	0	0
20	1	-28	9.079	0	0
21	1	-29	7.475	0	0
22	1	-30	5.818	0	0
23	1	-31	4.19	0	0
24	1	-32	2.682	0	0
25	1	-33	1.397	0	0
26	1	-34	.455	0	0
27	1	-35	0	0	0
28	1	Totals:	67.868	0	
29	1	COG (ft):	NC	NC	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	0	0
2			2	0	0	0
3			3	0	10.642	-214.747
4			4	0	-19.962	-176.369
5			5	0	-50.47	282.88

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	M1	20x0.545	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...
No Data to Print ...													

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
No Data to Print ...			

Joint Deflections

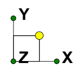
	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	-3	1.033	0	-1.386e-02
2	1	1	1.73	0	-1.468e-02
3	1	35	0	0	0
4	1	17	4.553	0	-1.47e-02
5	1	-21.5	-.477	0	1.306e-03
6	1	2	1.907	0	-1.47e-02
7	1	-4	.868	0	-1.341e-02
8	1	-5	.709	0	-1.287e-02
9	1	-6	.557	0	-1.223e-02
10	1	-7	.413	0	-1.152e-02
11	1	-8	.279	0	-1.075e-02
12	1	-9	.154	0	-9.927e-03
13	1	-10	.039	0	-9.065e-03
14	1	-11	-.065	0	-8.172e-03
15	1	-12	-.157	0	-7.255e-03
16	1	-13	-.239	0	-6.319e-03
17	1	-14	-.309	0	-5.37e-03
18	1	-15	-.368	0	-4.416e-03
19	1	-16	-.415	0	-3.465e-03
20	1	-17	-.451	0	-2.524e-03
21	1	-18	-.475	0	-1.604e-03
22	1	-19	-.489	0	-7.14e-04
23	1	-20	-.491	0	1.351e-04
24	1	-21	-.484	0	9.315e-04
25	1	-22	-.467	0	1.663e-03
26	1	-23	-.442	0	2.315e-03
27	1	-24	-.409	0	2.875e-03
28	1	-25	-.37	0	3.327e-03
29	1	-26	-.326	0	3.656e-03
30	1	-27	-.279	0	3.845e-03
31	1	-28	-.23	0	3.878e-03
32	1	-29	-.181	0	3.753e-03
33	1	-30	-.136	0	3.486e-03
34	1	-31	-.094	0	3.083e-03
35	1	-32	-.058	0	2.543e-03
36	1	-33	-.029	0	1.859e-03
37	1	-34	-.009	0	1.018e-03
38	1	-35	0	0	0

Member End Reactions

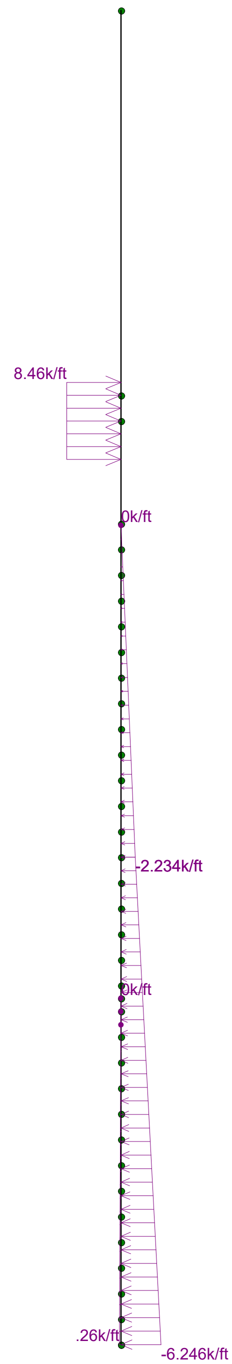
	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	0	0	0
2			J	0	-50.47	282.88

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	0	0	0	0
2			2	0	0	0	0
3			3	0	.639	16.339	-16.339
4			4	0	-1.199	13.419	-13.419
5			5	0	-3.03	-21.523	21.523

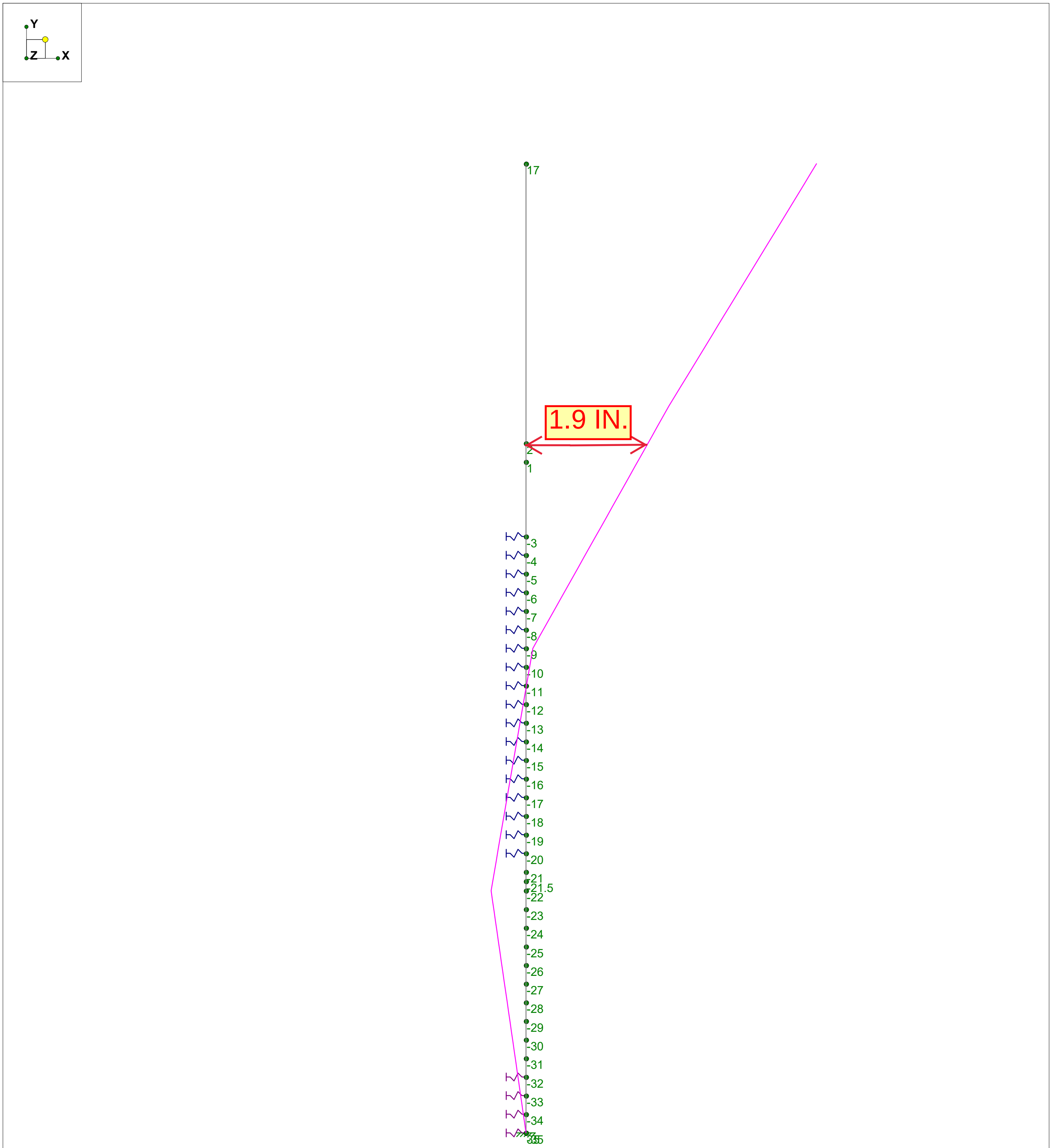


Final iteration using soil springs at each point showing deflection at EL 2.0



Loads: BLC 1, lateral
Results for LC 1, lateral
Y-direction Reaction Units are k and k-ft

MRCE		SK - 2
SK		Mar 12, 2019 at 6:42 PM
12541	LOADING	int wall(case2) - 3rd interation.r2d

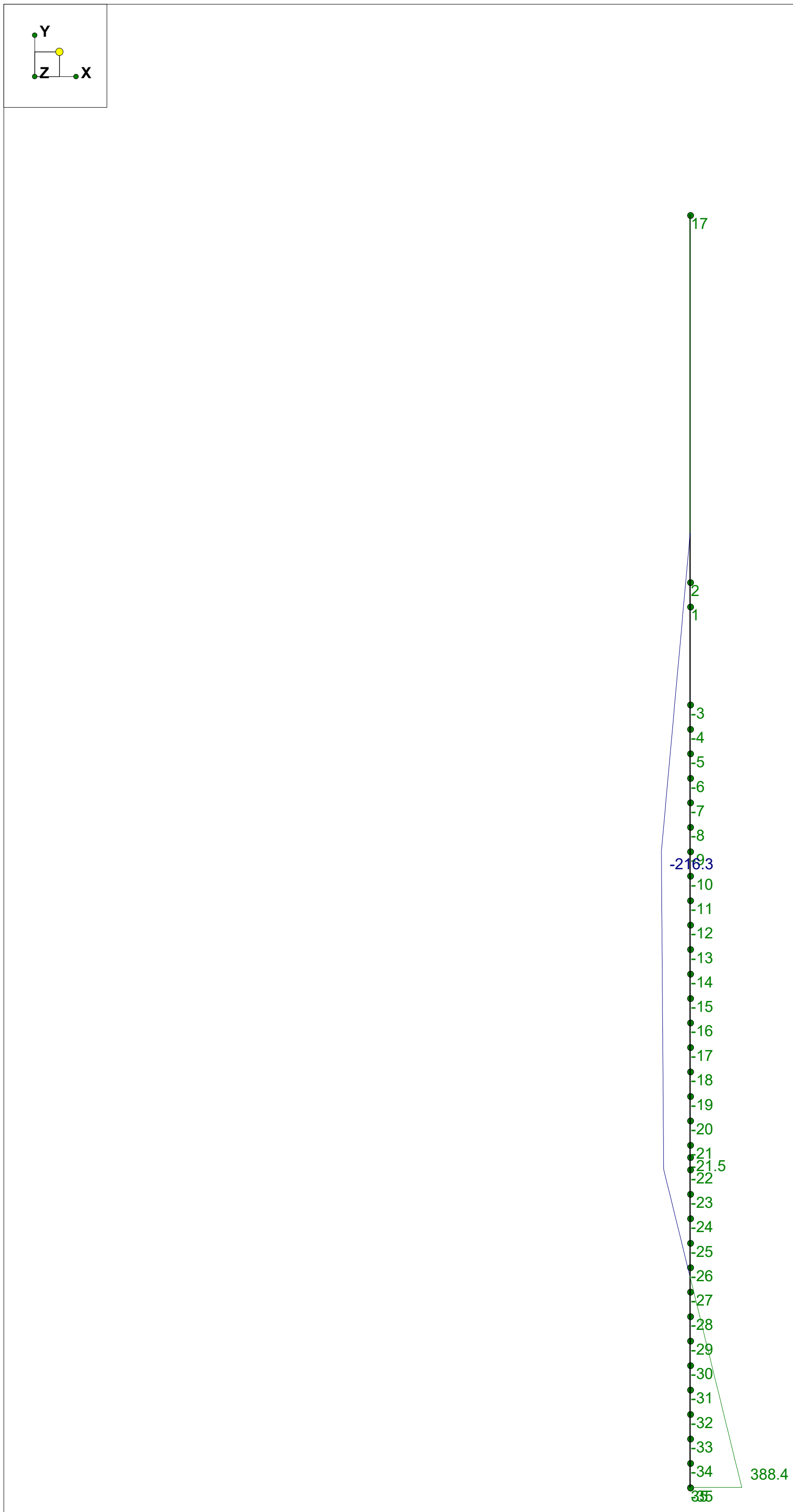


Results for LC 1, lateral

MRCE		SK - 1
SK		Mar 12, 2019 at 6:46 PM
12541	DEFLECTION	int wall(case2) - 3rd interation.r2d

Results for LC 1, lateral
X-direction Reaction Units are k and k-ft

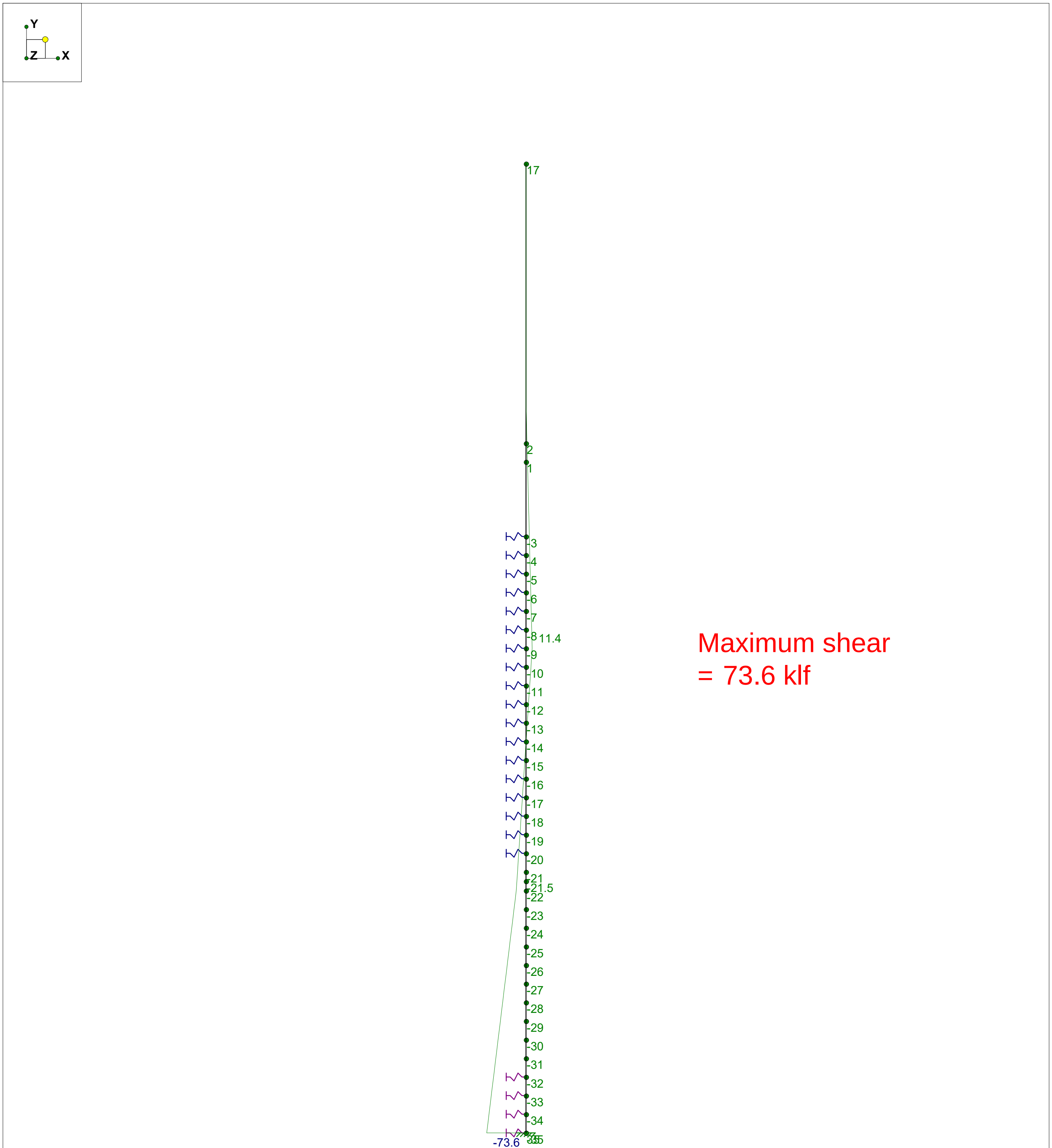
MRCE		SK - 1
SK		Mar 12, 2019 at 6:41 PM
12541	3RD & 4TH ITERATION - REACTION	int wall(case2) - 3rd interation.r2d



Maximum moment = 388.4 k-ft/ft

Results for LC 1, lateral
Member Bending Moments (k-ft)
Y-direction Reaction Units are k and k-ft

MRCE		SK - 3
SK		Mar 12, 2019 at 6:43 PM
12541	MOMENT	int wall(case2) - 3rd interation.r2d



Maximum shear
= 73.6 klf

Results for LC 1, lateral
Member Shear Forces (k)

MRCE		SK - 2
SK		Mar 12, 2019 at 6:46 PM
12541	SHEAR	int wall(case2) - 3rd interation.r2d

RISA A NEMETSCHEK COMPANY

Company : MRCE
Designer : SK
Job Number : 12541
Model Name :

Mar 12, 2019
6:43 PM
Checked By:_____

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	-3	0	-3	0
2	1	0	1	0
3	35	0	-35	0
4	17	0	17	0
5	-21.5	0	-21.5	0
6	2	0	2	0
7	-4	0	-4	0
8	-5	0	-5	0
9	-6	0	-6	0
10	-7	0	-7	0
11	-8	0	-8	0
12	-9	0	-9	0
13	-10	0	-10	0
14	-11	0	-11	0

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Temp [F]
15	-12	0	-12	0
16	-13	0	-13	0
17	-14	0	-14	0
18	-15	0	-15	0
19	-16	0	-16	0
20	-17	0	-17	0
21	-18	0	-18	0
22	-19	0	-19	0
23	-20	0	-20	0
24	-21	0	-21	0
25	-22	0	-22	0
26	-23	0	-23	0
27	-24	0	-24	0
28	-25	0	-25	0
29	-26	0	-26	0
30	-27	0	-27	0
31	-28	0	-28	0
32	-29	0	-29	0
33	-30	0	-30	0
34	-31	0	-31	0
35	-32	0	-32	0
36	-33	0	-33	0
37	-34	0	-34	0
38	-35	0	-35	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	35	Reaction	Reaction	Reaction
2	-3	TS.029		
3	-4	TS1.667		
4	-5	TS3.333		
5	-6	TS5		
6	-7	TS6.667		
7	-8	TS8.333		
8	-9	TS10		
9	-10	TS11.667		
10	-11	TS13.333		
11	-12	TS15		
12	-13	TS16.667		
13	-14	TS18.333		
14	-15	TS20		
15	-16	TS21.667		
16	-17	TS23.333		
17	-18	TS25		
18	-19	TS26.667		
19	-20	TS26.203		
20	-32	S46.203		
21	-33	S47.87		
22	-34	S49.537		
23	-35	S51.203		

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	17	35		20x0.545	Beam	None	A572 Gr.50	Typical

Member Distributed Loads (BLC 1 : lateral)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	0	.26	38.5	52
2	M1	X	-2.234	-6.246	33	52
3	M1	X	8.46	8.46	14.5	17.5
4	M1	X	0	-2.234	20.07	33

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	lateral	None					4

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	lateral				1	1																		

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	35	73.631	0	-388.43
2	1	-3	-.03	0	0
3	1	-4	-1.425	0	0
4	1	-5	-2.298	0	0
5	1	-6	-2.655	0	0
6	1	-7	-2.539	0	0
7	1	-8	-1.998	0	0
8	1	-9	-1.086	0	0
9	1	-10	0	0	0
10	1	-11	0	0	0
11	1	-12	0	0	0
12	1	-13	0	0	0
13	1	-14	0	0	0
14	1	-15	0	0	0
15	1	-16	0	0	0
16	1	-17	0	0	0
17	1	-18	0	0	0
18	1	-19	0	0	0
19	1	-20	0	0	0
20	1	-32	3.688	0	0
21	1	-33	1.939	0	0
22	1	-34	.639	0	0
23	1	-35	0	0	0
24	1	Totals:	67.868	0	
25	1	COG (ft):	NC	NC	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	0	0
2			2	0	0	0
3			3	0	11.399	-216.263
4			4	0	-18.295	-199.105
5			5	0	-73.631	388.43

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	M1	20x0.545	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...
No Data to Print ...													

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
No Data to Print ...			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	-3	1.027	0	-1.44e-02
2	1	1	1.749	0	-1.522e-02
3	1	35	0	0	0
4	1	17	4.675	0	-1.524e-02
5	1	-21.5	-.573	0	1.345e-03
6	1	2	1.933	0	-1.523e-02
7	1	-4	.855	0	-1.395e-02
8	1	-5	.689	0	-1.34e-02

Joint Deflections (Continued)

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
9	1	-6	.531	0	-1.277e-02
10	1	-7	.381	0	-1.206e-02
11	1	-8	.24	0	-1.128e-02
12	1	-9	.109	0	-1.045e-02
13	1	-10	-.012	0	-9.583e-03
14	1	-11	-.122	0	-8.677e-03
15	1	-12	-.221	0	-7.739e-03
16	1	-13	-.309	0	-6.775e-03
17	1	-14	-.384	0	-5.793e-03
18	1	-15	-.448	0	-4.799e-03
19	1	-16	-.5	0	-3.801e-03
20	1	-17	-.539	0	-2.807e-03
21	1	-18	-.567	0	-1.827e-03
22	1	-19	-.582	0	-8.7e-04
23	1	-20	-.587	0	5.214e-05
24	1	-21	-.58	0	9.281e-04
25	1	-22	-.563	0	1.745e-03
26	1	-23	-.536	0	2.491e-03
27	1	-24	-.501	0	3.15e-03
28	1	-25	-.458	0	3.708e-03
29	1	-26	-.409	0	4.149e-03
30	1	-27	-.355	0	4.457e-03
31	1	-28	-.298	0	4.615e-03
32	1	-29	-.239	0	4.605e-03
33	1	-30	-.182	0	4.409e-03
34	1	-31	-.128	0	4.006e-03
35	1	-32	-.08	0	3.376e-03
36	1	-33	-.041	0	2.507e-03
37	1	-34	-.013	0	1.388e-03
38	1	-35	0	0	0

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	0	0	0
2			J	0	-73.631	388.43

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	0	0	0	0
2			2	0	0	0	0
3			3	0	.684	16.454	-16.454
4			4	0	-1.098	15.149	-15.149
5			5	0	-4.421	-29.553	29.553

MUESER RUTLEDGE CONSULTING ENGINEERS

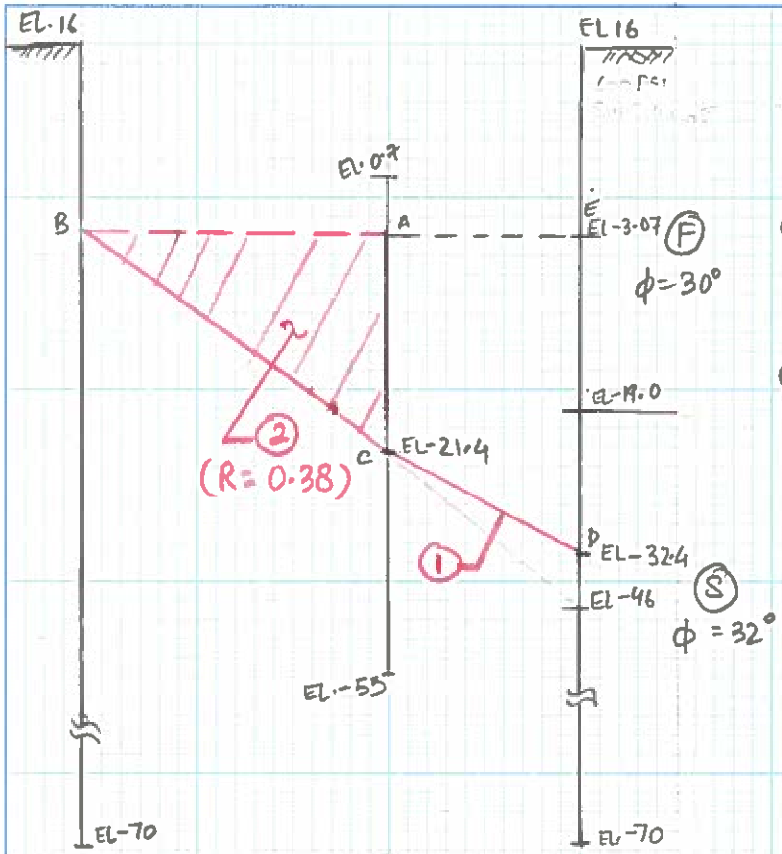
FILE 12541

PROJECT FIRST ST. TURNING BASIN

MADE BY SK DATE 03/11/2019

CHECKED BY AA DATE 3/11/2019

SUBJECT DRIVING FORCES FOR INTERIOR WALL (including contribution to passive pressures from north wall)



PASSIVE PRESSURE REDUCTION (NORTH WALL)

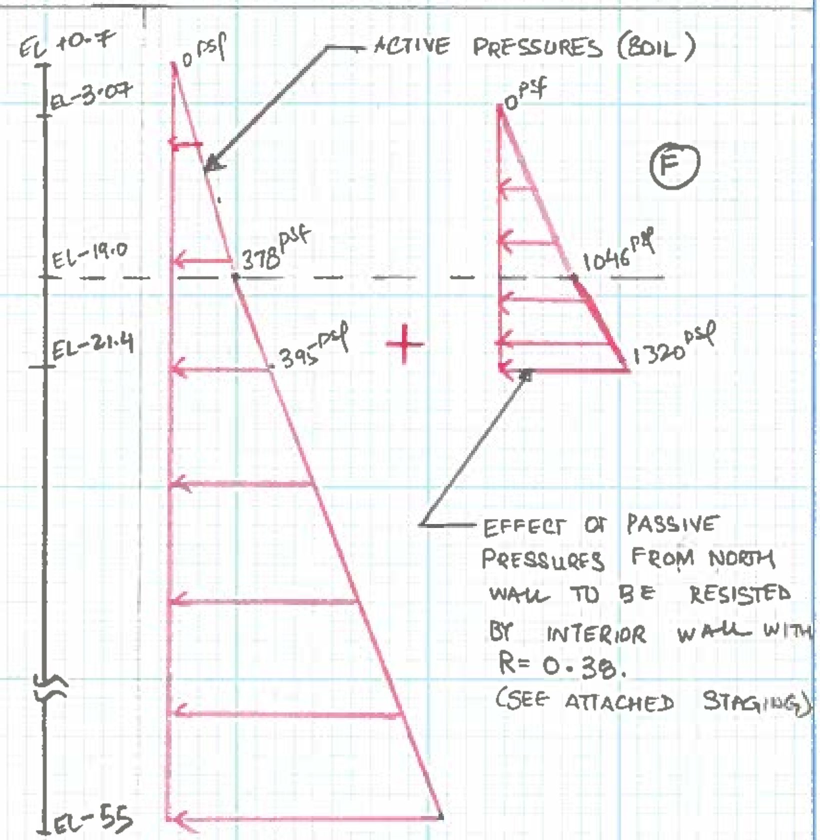
① DRAW PASSIVE PRESSURE PLANE FROM SUBGRADE EL-3.07 AS SHOWN. THIS PLANE IS SHOWN BY ABCDE.

② THE PORTION ABC (SHADED) IS CONTRIBUTING TO ACTIVE FORCES TO BE RESISTED BY INTERIOR WALL. A REDUCTION 'R' OF 38%. IS APPLIED TO PASSIVE PRESSURES FROM NORTH WALL

FOR INTERIOR WALL (PRESSURES TO BE RESISTED BY WALL)

→ SEE STAGING ANALYSIS FOR MOMENT, SHEAR AND DEFLECTION IN PILE

TOTAL DRIVING FORCES ON INTERIOR WALL



Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/13/2019

FOR First Street Turning Basin Refer to Section-B on SOE-300 and SOE-400.

Checked By: AA Date: 3/13/2019

SUBJECT: **INTERLOCKED PIPE PILE INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF- SOE STAGING - CASE 3**

Lateral Earth Pressures: Interior Wall Moves Towards South

Service Codition: Contribution to driving forces on interior wall including resistance to passive pressures from North wall

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	Passive pressure effect for North wall (psf)	Surcharge (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	0.7	0	57.6	0	0.333		1.00	0	0	240								240	0.70
	-2	2.7	57.6	156	0.333		1.00	52	177	240								469	-2.00
	-2	0	57.6	156	0.333		1.00	52	177	240								469	-2.00
	-2.5	0.5	57.6	184	0.333		1.00	61	210	240								512	-2.50
	-2.5	0	57.6	184	0.333		1.00	61	210	240								512	-2.50
	-9.3	6.8	57.6	576	0.333		1.00	192	657	240								1089	-9.30
	-9.3	0	57.6	576	0.333		1.00	192	657	100								949	-9.30
	-10	0.7	57.6	616	0.333		1.00	205	703	100								1008	-10.00
	-10	0	57.6	616	0.333		1.00	205	703	100								1008	-10.00
	-17.63	7.63	57.6	1056	0.333		1.00	352	1204	100								1656	-17.63
	-17.63	0	57.6	1056	0.333		1.00	352	0	100								452	-17.63
	-18.5	0.87	57.6	1106	0.333		1.00	369		100								469	-18.50
	-18.5	0	57.6	1106	0.333		1.00	369		100	0	57.6	0	3.0	1.0		0	469	-18.50
	-19	0.5	57.6	1135	0.333		1.00	378		100	0.5	57.6	28.8	3.0	1.00		-86	392	-19.00
S	-19	0	62.6	1135	0.307		1.00	349		100	0	62.6	28.8	3.3	1.00		-94	355	-19.00
	-19.3	0.3	62.6	1154	0.307		1.00	354		100	0.3	62.6	47.58	3.3	1.00		-155	300	-19.30
	-19.3	0	62.6	1154	0.307		1.00	354		0	0	62.6	47.58	3.3	1.00		-155	200	-19.30
	-60	40.7	62.6	3701	0.307		1.00	1137			40.7	62.6	2595	3.3	1.00		-8435	-7298	-60.00
	-60	0	62.6	3701	0.307		1.00	1137			0	62.6	2595	3.3	1.00		-8447	-7310	-60.00
	-90	30	62.6	5579	0.307		1.00	1714			30	62.6	4473	3.3	1.00		-14559	-12844.8	-90.00

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

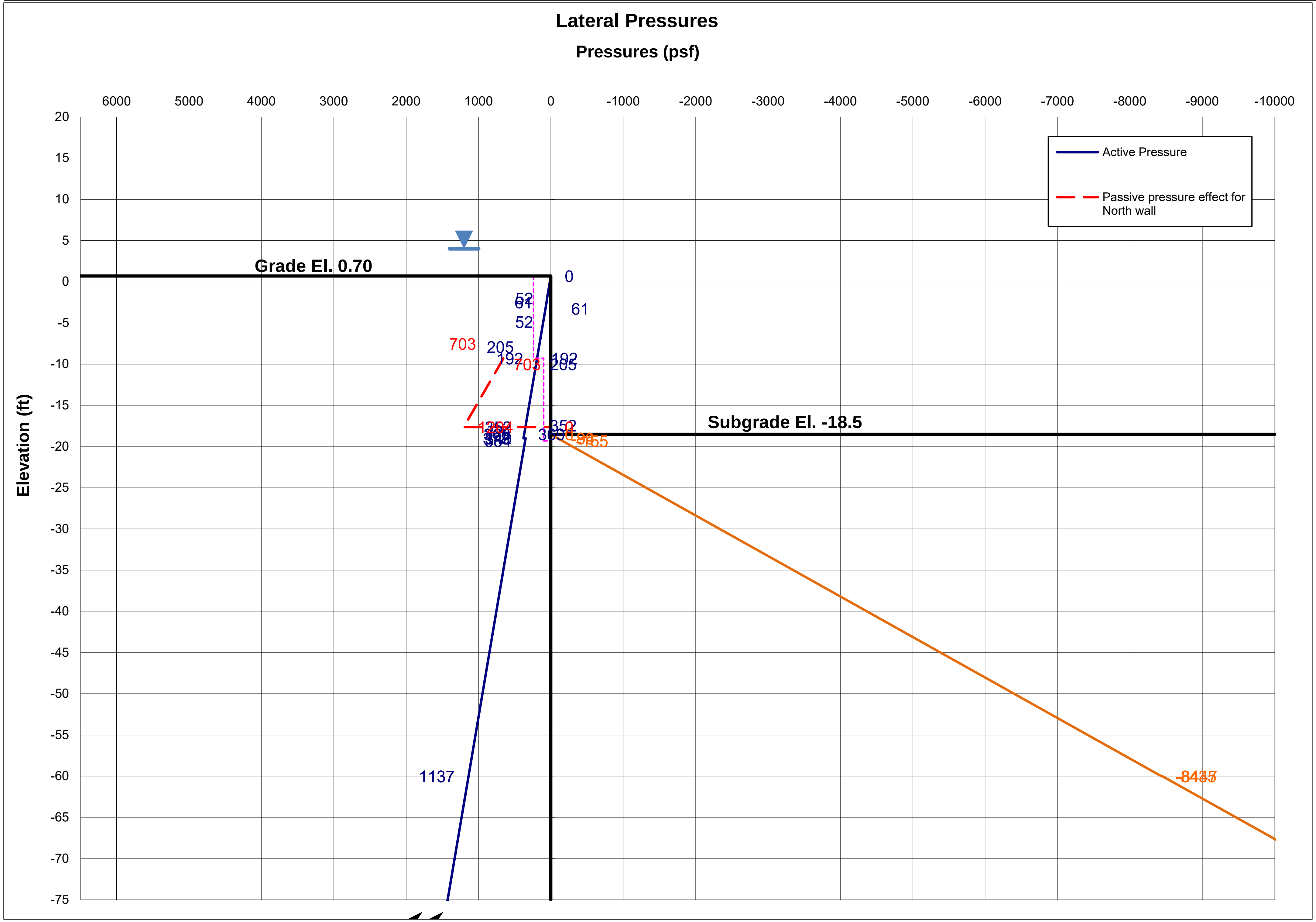
[2] Subgrade at EL-16

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: SK Date: 3/13/2019
Checked By: AA Date: 3/13/2019

FOR First Street Turning Basin

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. SOE STAGING - CASE 3**



Net Lateral Pressures

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

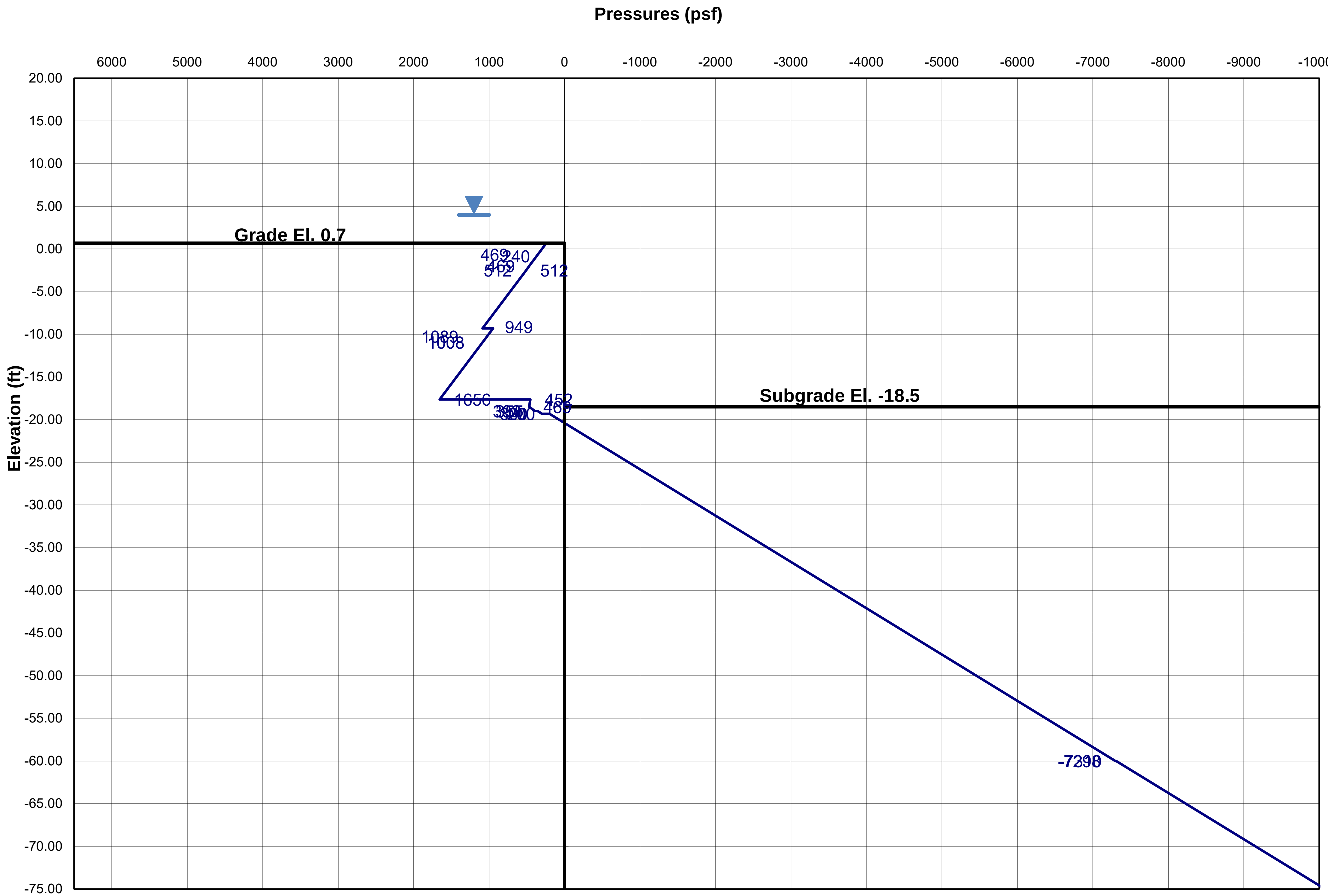
Made By: SK Date: 3/13/2019

Checked By: AA Date: 3/13/2019

FOR First Street Turning Basin

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. - SOE STAGING - CASE 3**

Net Lateral Pressures



MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows

Subject: Case 3: Driving forces on interior wall including contribution to resisting pressures for north wall. Refer to Section-B on SOE-300 and SOE-400.

FREE EARTH METHOD
For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.240	1.089	10.00
0.949	1.656	8.33
0.452	0.469	0.87
0.469	0.392	0.50

Pressure at slope (ksf): -0.355
Pressure slope (ksf/ft): 0.184

Flexural rigidity of wall [EI] (k-ft^2): 293724

Distance from top of wall to anchor (ft): 11.5

Results from analysis:
----

d = 4.50 ft embedment below z = 19.20
with FS=1.0

Total wall length = 23.70 ft

Anchor Pull = 18.06 k/ft
Moment at anchor = 37.23 k-ft/ft
Shear at anchor = 9.89 k/ft

Maximum positive moment = 1.08 k-ft/ft

Maximum moment = 37.23 k-ft/ft
Location of maximum moment = 11.50 ft below top of wall

Maximum shear = 9.89 k/ft

Maximum load = 1.66 ksf/ft
Maximum defl. = -0.08 in at 0.00 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.24	0.00	0.00	-0.08
1.19	0.34	0.34	-0.19	-0.07
2.37	0.44	0.81	-0.86	-0.06
3.56	0.54	1.39	-2.15	-0.05
4.74	0.64	2.09	-4.20	-0.04
5.93	0.74	2.91	-7.16	-0.03
7.11	0.84	3.85	-11.15	-0.02
8.30	0.94	4.91	-16.33	-0.02
9.48	1.04	6.09	-22.84	-0.01
10.67	1.01	7.29	-30.78	0.00
11.85	1.11	-9.51	-33.84	0.00
13.04	1.21	-8.14	-23.36	0.00
14.22	1.31	-6.65	-14.59	0.00
15.41	1.41	-5.04	-7.64	0.00
16.59	1.51	-3.32	-2.68	0.00
17.78	1.61	-1.47	0.17	0.00
18.96	0.46	-0.28	1.00	0.00
20.15	0.27	0.19	1.02	0.00
21.33	0.06	0.39	0.66	0.00
22.52	-0.16	0.32	0.21	0.00
23.70	-0.38	0.00	0.00	0.00

```
                         Pressure    (P/Pmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                          *   |
  1.2                        *     |
  2.4                      *       |
  3.6                    *         |
  4.7                  *           |
  5.9                 *            |
  7.1               *              |
  8.3             *                |
  9.5           *                  |
 10.7            *                 |
 11.9          *                   |
 13.0        *                     |
 14.2      *                       |
 15.4    *                         |
 16.6   *                          |
 17.8 *                            |
 19.0                      *       |
 20.1                         *    |
 21.3                             *|
 22.5                              |  *
 23.7                              |      *
```

```
                           Moment    (M/Mmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  1.2                              *
  2.4                             *|
  3.6                            * |
  4.7                           *  |
  5.9                        *     |
  7.1                     *        |
  8.3                 *            |
  9.5            *                 |
 10.7     *                        |
 11.9   *                          |
 13.0           *                  |
 14.2                  *           |
 15.4                        *     |
 16.6                            * |
 17.8                              *
 19.0                              |*
 20.1                              |*
 21.3                              |*
 22.5                              *
 23.7                              *
```

```
                            Shear    (V/Vmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  1.2                              |*
  2.4                              | *
  3.6                              |   *
  4.7                              |     *
  5.9                              |        *
  7.1                              |           *
  8.3                              |              *
  9.5                              |                 *
 10.7                              |                     *
 11.9 *                            |
 13.0     *                        |
 14.2          *                   |
 15.4               *              |
 16.6                    *         |
 17.8                          *   |
 19.0                             *|
 20.1                              |*
 21.3                              |*
 22.5                              |*
 23.7                              *
```

```
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              |                             *
  1.2                              |                         *
  2.4                              |                      *
  3.6                              |                  *
  4.7                              |               *
  5.9                              |           *
  7.1                              |        *
  8.3                              |     *
  9.5                              |  *
 10.7                              |*
 11.9                              *
 13.0                             *|
 14.2                            * |
 15.4                            * |
 16.6                             *|
 17.8                             *|
 19.0                             *|
 20.1                             *|
 21.3                              *
 22.5                              *
 23.7                              *
```

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/13/2019

FOR First Street Turning Basin Refer to Section-B on SOE-300 and SOE-400.

Checked By: Date: 3/13/2019

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. - SOE STAGING - CASE 4 (LIQUEFACTION)** **case 1**

Lateral Earth Pressures: Interior Wall Moves Towards South

Liquefaction case: Contribution to driving forces on interior wall without resistance to passive pressures from North wall

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	Brace effect from North wall (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	0.7	0	57.6	0	0.333		1.00	0										0	0.70
	-2	2.7	57.6	156	0.333		1.00	52										52	-2.00
	-2	0	57.6	156	0.333		1.00	52										52	-2.00
	-2.5	0.5	57.6	184	0.333		1.00	61										61	-2.50
	-2.5	0	57.6	184	0.333		1.00	61										61	-2.50
	-3	0.5	57.6	213	0.333		1.00	71										71	-3.00
	-3	0	57.6	213	0.333		1.00	71										71	-3.00
	-3.07	0.07	57.6	217	0.333		1.00	72										72	-3.07
	-3.07	0	57.6	217	0.333		1.00	72										72	-3.07
	-10	6.93	57.6	616	0.333		1.00	205										205	-10.00
	-10	0	57.6	616	0.333		1.00	205										205	-10.00
	-18.5	8.5	57.6	1106	0.333		1.00	369										369	-18.50
	-18.5	0	57.6	1106	0.333		1.00	369			0	62.6	0	0.0	1.0		0	369	-18.50
	-19	0.5	57.6	1135	0.333		1.00	378			0.5	62.6	31.3	0.0	1.00		0	378	-19.00
S	-19	0	62.6	1135	0.307		1.00	349			0	62.6	31.3	0.0	1.00		0	349	-19.00
	-60	41	62.6	3701	0.307		1.00	1137			41	62.6	2598	0.0	1.00		0	1137	-60.00
	-60	0	62.6	3701	0.307		1.00	1137			0	62.6	2598	3.3	1.00		-8455	-7318	-60.00
	-100	40	62.6	6205	0.307		1.00	1907			40	62.6	5102	3.3	1.00		-16605	-14697.9	-100.00

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

1 Coefficient of active and passive earth pressure based on Rankine Theory.

2 Subgrade at EL-16

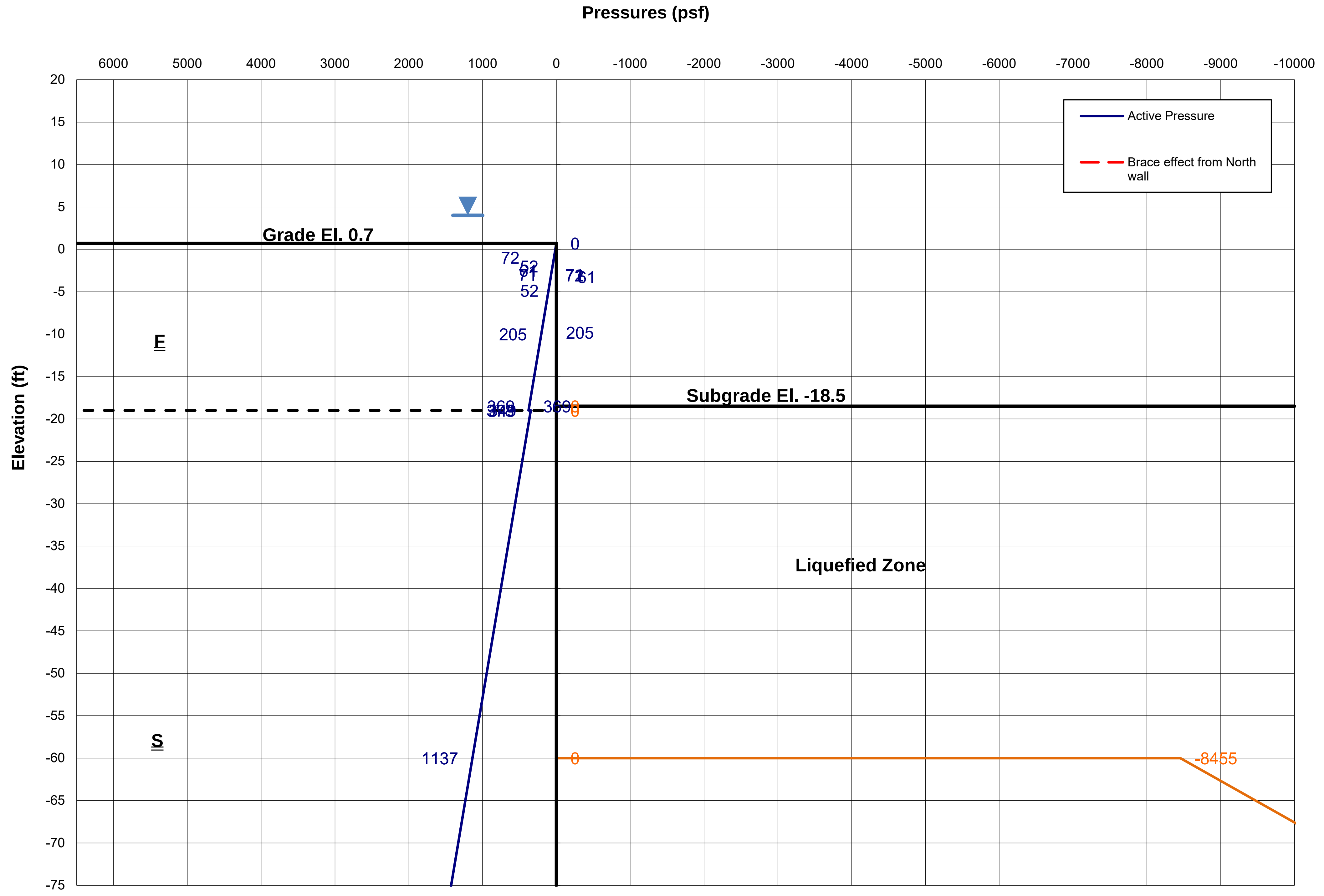
MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: SK Date: 3/13/2019
Checked By: Date: 3/13/2019

FOR First Street Turning Basin

SUBJECT: **PIPE PILE : INTERIOR - SOE STAGING - CASE 4** **case 1**

Lateral Pressures



Net Lateral Pressures

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

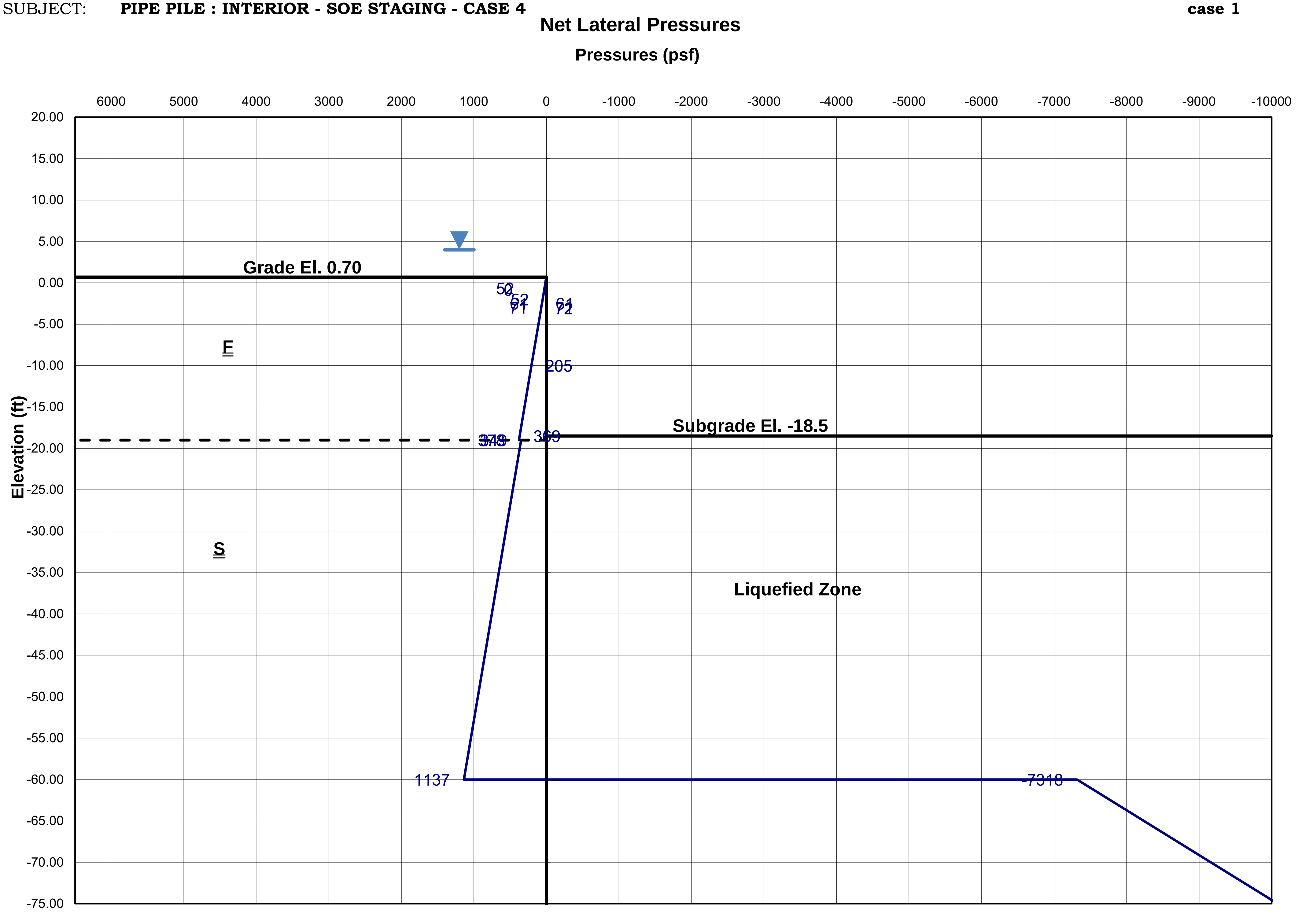
File: 12541

Made By: SK Date: 3/13/2019

Checked By: Date: 3/13/2019

FOR First Street Turning Basin

SUBJECT: **PIPE PILE : INTERIOR - SOE STAGING - CASE 4** **case 1**

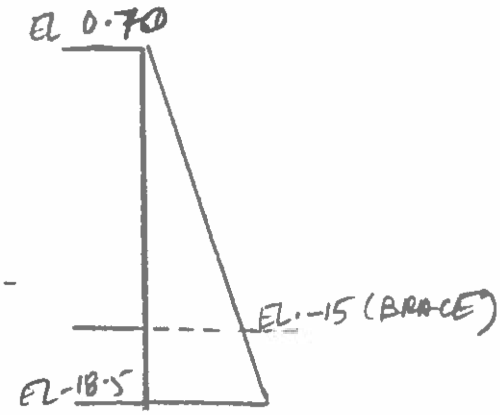


MADE BY: SK 12/20/2018

Case 4: Contribution to driving foces on interior wall without resistance to passive pressures from north wall.
Refer to Section-B on SOE-300 and SOE-400.

MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows



Subject:

FREE EARTH METHOD
For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.000	0.052	2.70
0.052	0.061	0.50
0.061	0.071	0.50
0.071	0.072	0.07
0.072	0.205	6.93
0.205	0.369	8.50 SUBGRADE
0.369	0.378	0.50
0.349	1.137	41.00

Pressure at slope (ksf): 7.318
Pressure slope (ksf/ft): 0.184

Flexural rigidity of wall [EI] (k-ft^2): 293724

Distance from top of wall to anchor (ft): 14.3

Results from analysis:

d = 43.99 ft embedment below z = 19.20
with FS=1.0

Total wall length = 63.19 ft

Anchor Pull = 15.41 k/ft
Moment at anchor = 9.34 k-ft/ft
Shear at anchor = 13.45 k/ft

Maximum positive moment = 197.49 k-ft/ft

Maximum moment = 197.49 k-ft/ft
Location of maximum moment = 40.86 ft below top of wall

Maximum shear = 18.74 k/ft

Maximum load = -7.78 ksf/ft
Maximum defl. = -1.96 in at 41.07 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.00	0.00	0.00	1.72
3.16	0.06	0.10	-0.10	1.34
6.32	0.12	0.38	-0.81	0.96
9.48	0.18	0.86	-2.72	0.58
12.64	0.24	1.53	-6.44	0.20
15.80	0.30	-13.01	10.48	-0.18
18.96	0.36	-11.96	49.98	-0.56
22.12	0.40	-10.78	85.93	-0.92
25.28	0.46	-9.44	117.92	-1.24
28.43	0.52	-7.90	145.36	-1.52
31.59	0.58	-6.17	167.64	-1.73
34.75	0.64	-4.25	184.16	-1.89
37.91	0.70	-2.14	194.31	-1.95
41.07	0.76	0.17	197.47	-1.96
44.23	0.82	2.66	193.06	-1.86
47.39	0.88	5.35	180.45	-1.70
50.55	0.94	8.23	159.05	-1.45
53.71	1.00	11.30	128.24	-1.16
56.87	1.06	14.57	87.43	-0.79
60.03	1.12	18.02	36.00	-0.41
63.19	-7.78	0.00	0.05	0.00

```
                         Pressure     (P/Pmax)

    1.0            0.5            0.0            -.5            -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                             *
  3.2                             *
  6.3                             *
  9.5                            *|
 12.6                            *|
 15.8                            *|
 19.0                            *|
 22.1                           * |
 25.3                           * |
 28.4                           * |
 31.6                           * |
 34.8                           * |
 37.9                          *  |
 41.1                          *  |
 44.2                          *  |
 47.4                          *  |
 50.6                         *   |
 53.7                         *   |
 56.9                         *   |
 60.0                         *   |
 63.2                             |                              *
```

```
                         Moment     (M/Mmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  3.2                              *
  6.3                              *
  9.5                              *
 12.6                             *|
 15.8                              | *
 19.0                              |       *
 22.1                              |            *
 25.3                              |                 *
 28.4                              |                     *
 31.6                              |                        *
 34.8                              |                           *
 37.9                              |                             *
 41.1                              |                             *
 44.2                              |                            *
 47.4                              |                          *
 50.6                              |                       *
 53.7                              |                  *
 56.9                              |            *
 60.0                              |    *
 63.2                              *
```

```
                          Shear     (V/Vmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  3.2                              *
  6.3                              |*
  9.5                              |*
 12.6                              | *
 15.8         *                    |
 19.0           *                  |
 22.1             *                |
 25.3               *              |
 28.4                 *            |
 31.6                    *         |
 34.8                       *      |
 37.9                           *  |
 41.1                              *
 44.2                              |   *
 47.4                              |        *
 50.6                              |            *
 53.7                              |                 *
 56.9                              |                      *
 60.0                              |                            *
 63.2                              *
```

```
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0    *                         |
  3.2         *                    |
  6.3               *              |
  9.5                     *        |
 12.6                           *  |
 15.8                              |  *
 19.0                              |        *
 22.1                              |             *
 25.3                              |                  *
 28.4                              |                      *
 31.6                              |                          *
 34.8                              |                            *
 37.9                              |                             *
 41.1                              |                             *
 44.2                              |                           *
 47.4                              |                         *
 50.6                              |                     *
 53.7                              |                 *
 56.9                              |           *
 60.0                              |     *
 63.2                              *
```

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK   Date: 3/13/2019

Checked By: AA   Date: 3/13/2019

FOR First Street Turning Basin   Refer to Section-B on SOE-300 and SOE-400.

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. - SOE STAGING - CASE 5 (LIQUEFACTION)**   **case 1**

Lateral Earth Pressures: Interior Wall Moves Towards South

Liquefaction Codition: Contribution to driving forces on interior wall including resistance to passive pressures from North wa

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	Passive pressure effect for North wall (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	Net Pressure [psf]	Elev [ft]
F	0.7	0	57.6	0	0.333		1.00	0	0									0	0.70
	-2	2.7	57.6	156	0.333		1.00	52	177									229	-2.00
	-2	0	57.6	156	0.333		1.00	52	177									229	-2.00
	-2.5	0.5	57.6	184	0.333		1.00	61	210									272	-2.50
	-2.5	0	57.6	184	0.333		1.00	61	210									272	-2.50
	-3.07	0.57	57.6	217	0.333		1.00	72	248									320	-3.07
	-3.07	0	57.6	217	0.333		1.00	72	248									320	-3.07
	-10	6.93	57.6	616	0.333		1.00	205	703									908	-10.00
	-10	0	57.6	616	0.333		1.00	205	703									908	-10.00
	-17.63	7.63	57.6	1056	0.333		1.00	352	1204									1556	-17.63
	-17.63	0	57.6	1056	0.333		1.00	352	0									352	-17.63
	-18.5	0.87	57.6	1106	0.333		1.00	369										369	-18.50
	-18.5	0	57.6	1106	0.333		1.00	369			0	57.6	0	0.0	1.0		0	369	-18.50
	-19	0.5	57.6	1135	0.333		1.00	378			0.5	57.6	28.8	0.0	1.00		0	378	-19.00
S	-19	0	62.6	1135	0.307		1.00	349			0	62.6	28.8	0.0	1.00		0	349	-19.00
	-21.4	2.4	62.6	1285	0.307		1.00	395			2.4	62.6	179	0.0	1.00		0	395	-21.40
	-21.4	0	62.6	1285	0.307		1.00	395			0	62.6	179	0.0	1.00		0	395	-21.40
	-60	38.6	62.6	3701	0.307		1.00	1137			38.6	62.6	2595	0.0	1.00		0	1137	-60.00
	-60	0	62.6	3701	0.307		1.00	1137			0	62.6	2595	3.3	1.00		-8447	-7310	-60.00
	-90	30	62.6	5579	0.307		1.00	1714			30	62.6	4473	3.3	1.00		-14559	-12844.8	-90.00

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade at EL-16

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

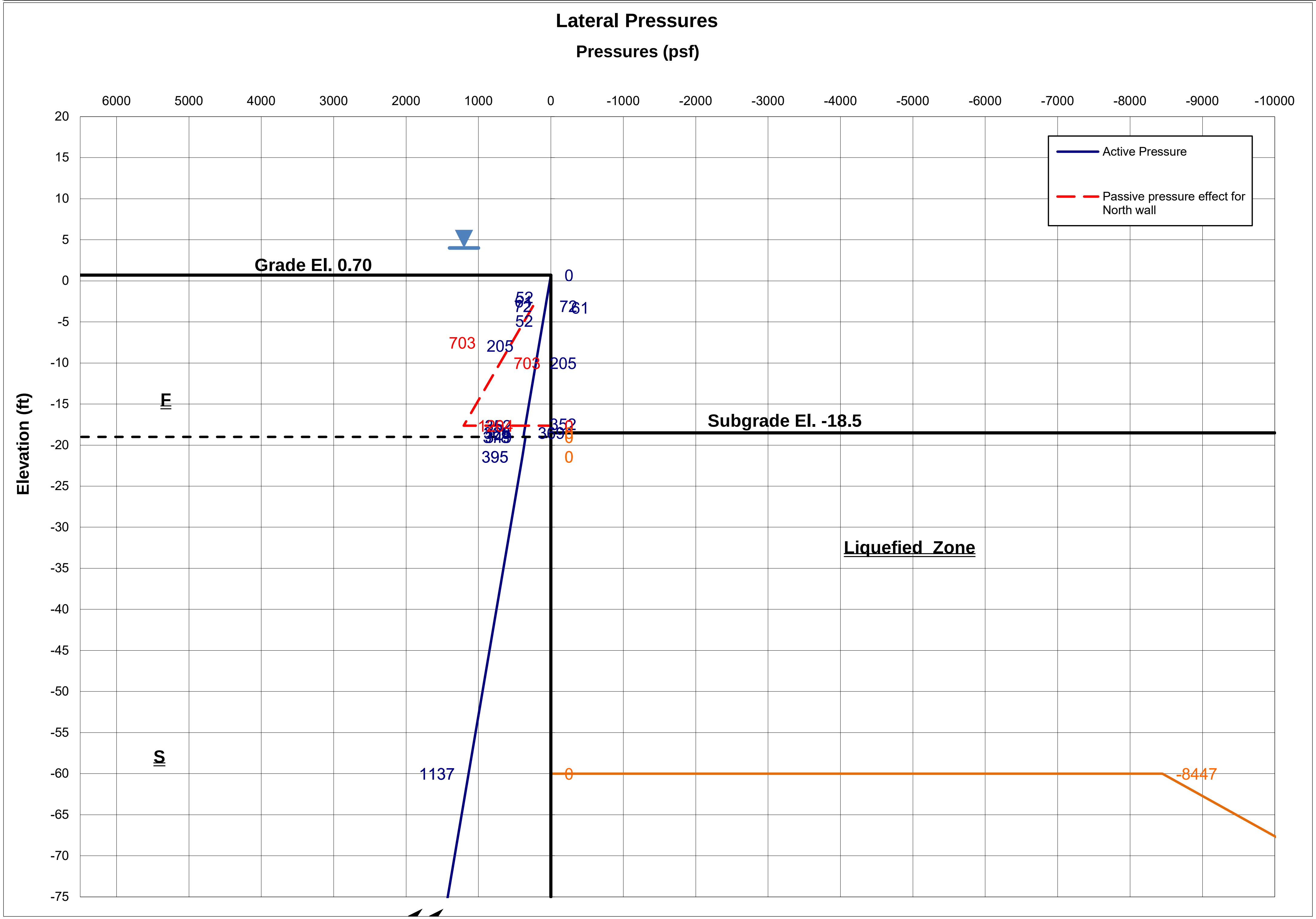
File: 12541

Made By: SK Date: 3/13/2019

FOR First Street Turning Basin

Checked By: AA Date: 3/13/2019

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. - SOE STAGING - CASE 5** **case 1**



Net Lateral Pressures

Sheet No. _______ of _______

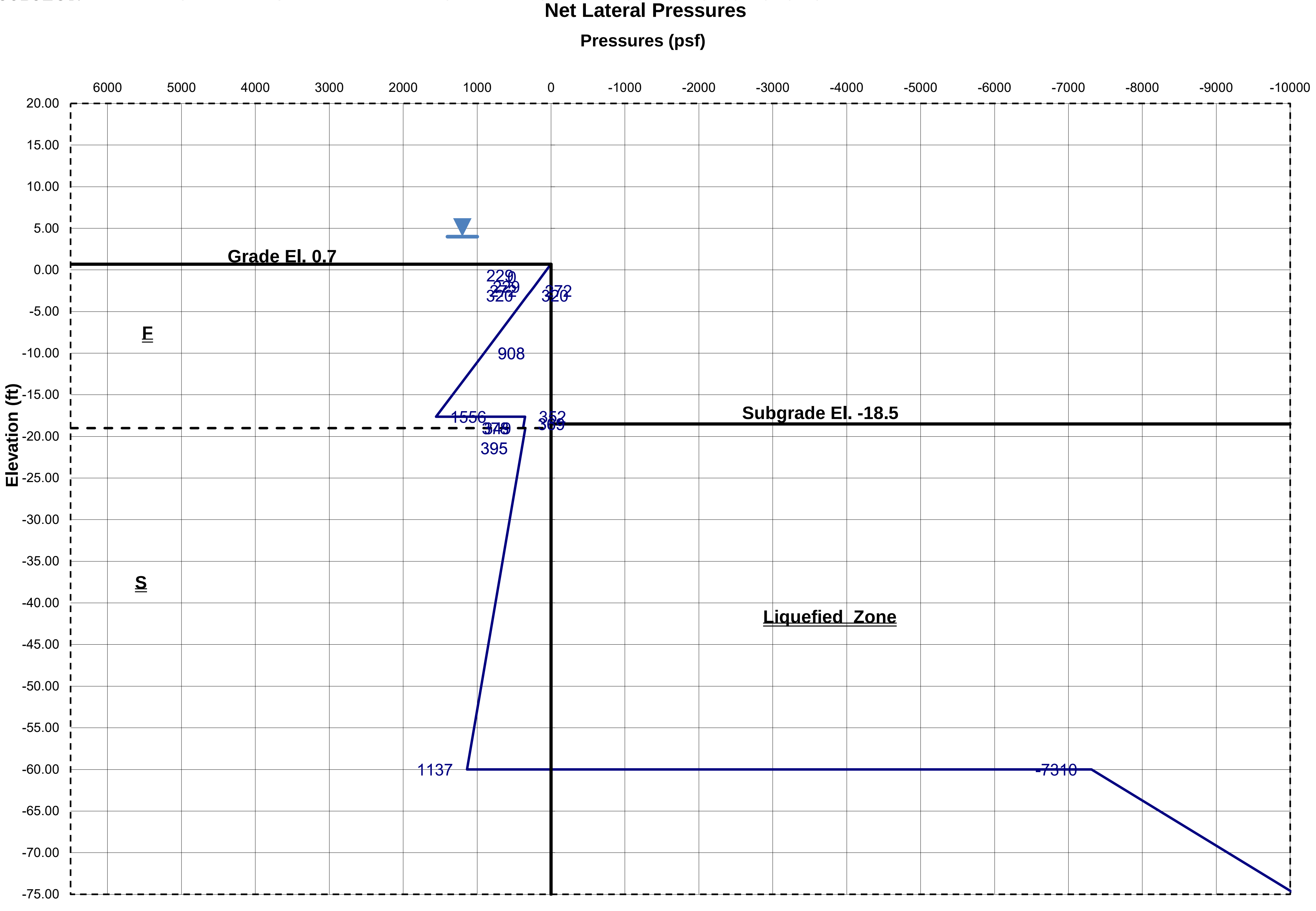
MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 3/13/2019

FOR First Street Turning Basin Checked By: AA Date: 3/13/2019

SUBJECT: **INTERIOR WALL FOR INTERTIDAL VEGETATIVE SHELF. - SOE STAGING - CASE 5** **case 1**



MUESER RUTLEDGE CONSULTING ENGINEERS

Anchored Wall Analysis V2.1 for Windows

Subject: Case 5 (Liquefaction): Driving forces on interior wall including resistance to pressures from north wall. Refer to Section-B on SOE-300 and SOE-400.

FREE EARTH METHOD

For an anchored wall with the following input:

p (ksf)	q (ksf)	interval (ft)
0.000	1.556	18.33
0.352	0.369	0.87
0.369	0.378	0.50
0.349	1.137	40.00

Pressure at slope (ksf): 7.31
Pressure slope (ksf/ft): 0.184

Flexural rigidity of wall [EI] (k-ft^2): 293724

Distance from top of wall to anchor (ft): 15.7

Results from analysis:

d = 42.77 ft embedment below z = 19.20
with FS=1.0

Total wall length = 61.97 ft

Anchor Pull = 27.42 k/ft
Moment at anchor = 54.75 k-ft/ft
Shear at anchor = 16.95 k/ft

Maximum positive moment = 161.69 k-ft/ft

Maximum moment = 161.69 k-ft/ft
Location of maximum moment = 41.97 ft below top of wall

Maximum shear = 16.95 k/ft

Maximum load = -7.73 ksf/ft
Maximum defl. = -1.39 in at 40.28 ft below top of wall

X (ft)	P (ksf/ft)	V (k/ft)	M (k-ft/ft)	DEF (in)
0.00	0.00	0.00	0.00	1.09
3.10	0.26	0.41	-0.42	0.88
6.20	0.53	1.63	-3.37	0.67
9.30	0.79	3.67	-11.36	0.46
12.39	1.05	6.52	-26.94	0.24
15.49	1.32	10.19	-52.61	0.02
18.59	0.36	-13.06	-11.61	-0.24
21.69	0.39	-11.92	27.12	-0.49
24.79	0.45	-10.62	62.10	-0.73
27.89	0.51	-9.14	92.77	-0.96
30.98	0.57	-7.46	118.53	-1.14
34.08	0.63	-5.60	138.82	-1.28
37.18	0.69	-3.54	153.03	-1.35
40.28	0.75	-1.30	160.58	-1.39
43.38	0.82	1.13	160.90	-1.34
46.48	0.88	3.75	153.38	-1.24
49.58	0.94	6.56	137.45	-1.07
52.67	1.00	9.56	112.52	-0.86
55.77	1.06	12.75	78.00	-0.59
58.87	1.12	16.13	33.31	-0.31
61.97	-7.73	0.00	0.01	0.00

```
                         Pressure     (P/Pmax)

    1.0            0.5            0.0            -.5          -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  3.1                             *|
  6.2                            * |
  9.3                           *  |
 12.4                          *   |
 15.5                         *    |
 18.6                             *|
 21.7                            * |
 24.8                            * |
 27.9                            * |
 31.0                            * |
 34.1                            * |
 37.2                           *  |
 40.3                           *  |
 43.4                           *  |
 46.5                           *  |
 49.6                          *   |
 52.7                          *   |
 55.8                          *   |
 58.9                          *   |
 62.0                              |                             *
```

```
                           Moment    (M/Mmax)

    1.0            0.5            0.0            -.5          -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  3.1                              *
  6.2                             *|
  9.3                            * |
 12.4                         *    |
 15.5                    *         |
 18.6                            * |
 21.7                              |    *
 24.8                              |           *
 27.9                              |                *
 31.0                              |                     *
 34.1                              |                         *
 37.2                              |                           *
 40.3                              |                             *
 43.4                              |                             *
 46.5                              |                           *
 49.6                              |                         *
 52.7                              |                    *
 55.8                              |             *
 58.9                              |     *
 62.0                              *
```

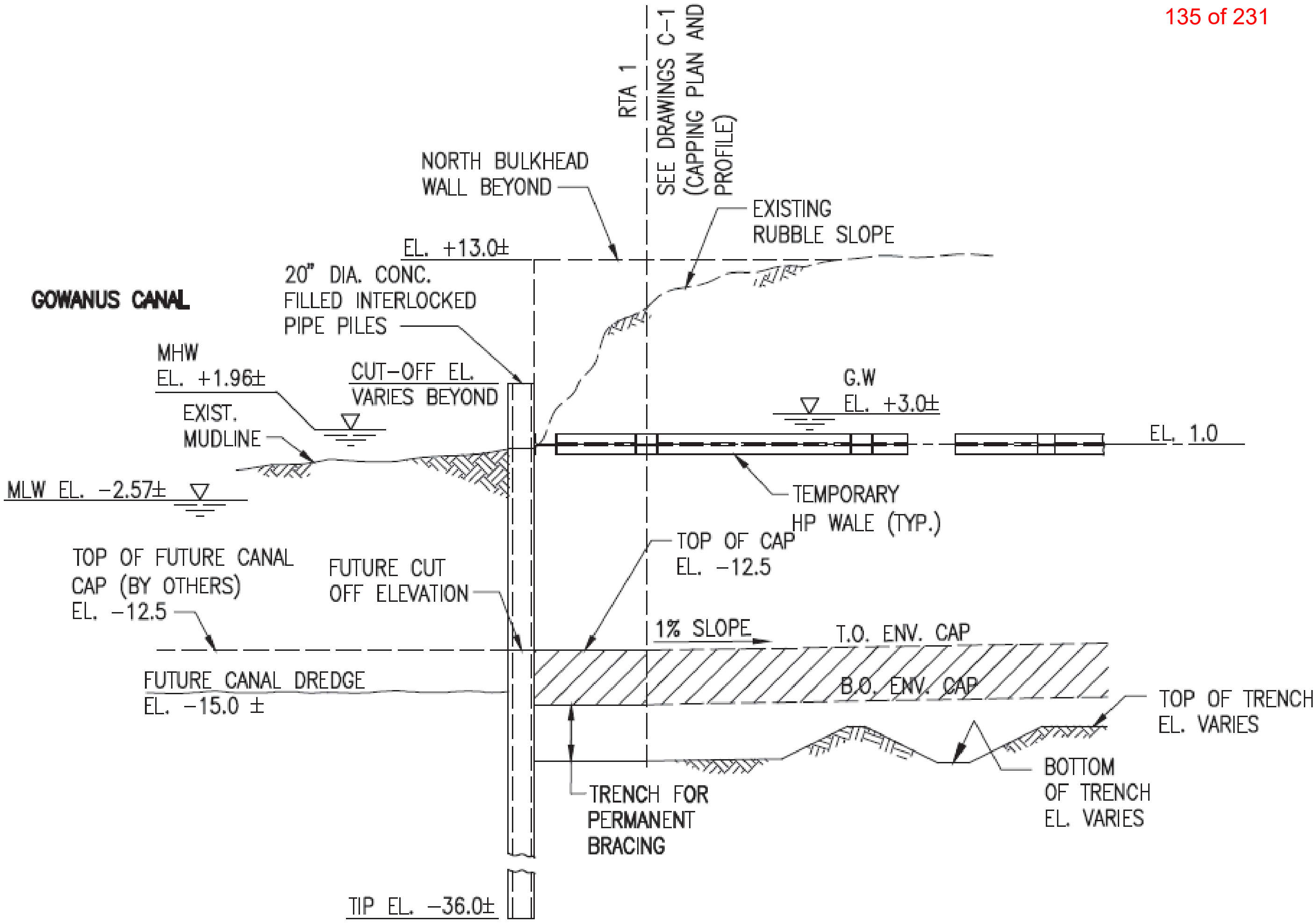
```
                            Shear    (V/Vmax)

    1.0            0.5            0.0            -.5          -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              *
  3.1                              |*
  6.2                              |  *
  9.3                              |     *
 12.4                              |           *
 15.5                              |                 *
 18.6        *                      |
 21.7          *                    |
 24.8            *                  |
 27.9               *               |
 31.0                  *            |
 34.1                     *         |
 37.2                         *     |
 40.3                             * |
 43.4                              | *
 46.5                              |      *
 49.6                              |           *
 52.7                              |                *
 55.8                              |                      *
 58.9                              |                            *
 62.0                              *
```

```
                    Deflection    (DELTA/DELTAmax)

    1.0            0.5            0.0            -.5           -1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0      *                       |
  3.1           *                  |
  6.2               *              |
  9.3                    *         |
 12.4                         *    |
 15.5                              *
 18.6                              |    *
 21.7                              |          *
 24.8                              |               *
 27.9                              |                    *
 31.0                              |                        *
 34.1                              |                           *
 37.2                              |                            *
 40.3                              |                             *
 43.4                              |                            *
 46.5                              |                          *
 49.6                              |                      *
 52.7                              |                  *
 55.8                              |            *
 58.9                              |      *
 62.0                              *
```

CLOSURE WALL AT BASIN ENTRANCE
20" DIA. INTERLOCKED PIPE PILE
(AT GOWANUS CANAL INTERFACE)



SECTION E
SCALE: 1/8"=1'-0"
SOE-300 | SOE-401

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin

Checked By: ________ Date: 4/16/2019

SUBJECT: **SOE STAGING SUMMARY : WEST RETAINING WALL (20.5" DIA. INTERLOCKED PIPE PILES) ALONG THE CANAL**

SECTION / STAGE	Maximum Wall Moment	Maximum Wall Shear	Subgrade Elevation	Embedment Depth below Subgrade	Minimum Pile Tip Elevation	Max. Deflection	Notes
	M_{max}	V_{max}		FS = 1.5	FS = 1.2		
	k*ft/ft	k/ft	El.	ft	El.	in	in
Case 1 Grade EL. 1 Excavate to EL. -15 Cantilever (No lag in water on either side of pipe piles)	32.5	11.1	-15.0	21.0	-36.0	0.4	No surcharge
Case 2 Grade EL. 1 Excavate to EL. -15 Cantilever (2 ft. lag in water between two sides of pipe piles)	69.1	18.4	-15.0	21.0	-36.0	1.1	No surcharge

*Maximum deflection in each stage occurs at top of wall.

Refer to Section-E on SOE-300 and SOE-401.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK | Date: 4/16/2019

FOR First Street Turning Basin | Checked By: | Date: 4/16/2019

SUBJECT: **SOE STAGING SUMMARY : WEST RETAINING WALL (20.5" DIA. INTERLOCKED PIPE PILES) ALONG THE CANAL**

	Check		
	fy	50	
Reqd S	M/0.6fy	27.64	in^3
Int Wall	20"x0.625" pipe		
	Max M	69.1	k*ft
	Max V	18.4	kip
	S available	147.0	in^3
	Stress (static)	5.6	ksi
	Shear area available	19	in^2
	Shear area reqd	0.92	ksi

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin Checked By: Date: 4/16/2019

SUBJECT: **WEST CLOSURE WALL AT ENTRANCE TO BASIN- SOE STAGING** **Stage 1**

Lateral Earth Pressures: Stage 1: Excavate to EL -15.0 with no lag in water on either side of pipe piles.

	DRIVING FORCES										RESISTING FORCES							Net Pressure	Elev
Layer [1]	Elev [ft]	H [ft]	γ [pcf]	σ_v [psf]	k_a	c [psf]	R_a	Active Pressure [psf]	600psf Construction Surcharge (psf)	Water Pressure (psf)	H [ft]	γ [pcf]	σ_v [psf]	k_p	R_p [psf]	c [psf]	Passive Pressure [psf]	[psf]	[ft]
F	2	0	0	0	0.333		1.00	0										0	2
	1	1	0	0	0.333		1.00	0										0	1
	1	0	57.6	0	0.333		1.00	0										0	1
	-1	2	57.6	115	0.333		1.00	38										38	-1
	-1	0	57.6	115	0.333		1.00	38										38	-1
	-5	4	57.6	346	0.333		1.00	115										115	-5
	-5	0	57.6	346	0.333		1.00	115										115	-5
	-9	4	57.6	576	0.333		1.00	192										192	-9
	-9	0	57.6	576	0.333		1.00	192										192	-9
	-15	6	57.6	922	0.333		1.00	307										307	-15
	-15	0	57.6	922	0.333		1.00	307			0	52.6	0	3.00	1.00		0	307	-15
	-19	4	57.6	1152	0.333		1.00	384			4	52.6	210	3.00	1.00		-631	-247	-19
S	-19	0	62.6	1152	0.307		1.00	354			0	62.6	210	3.25	1.00		-685	-331	-19
	-21.5	2.5	62.6	1309	0.307		1.00	402			2.5	62.6	367	3.25	1.00		-1194	-792	-21.5
	-21.5	0	62.6	1309	0.307		1.00	402			0	62.6	367	3.25	1.00		-1194	-792	-21.5
	-25	3.5	62.6	1528	0.307		1.00	469			3.5	62.6	586	3.25	1.00		-1907	-1438	-25

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade slopes from ~El. 0.0 to ~El.-1 .0 so avg. EL. -0.5 used as subgrade

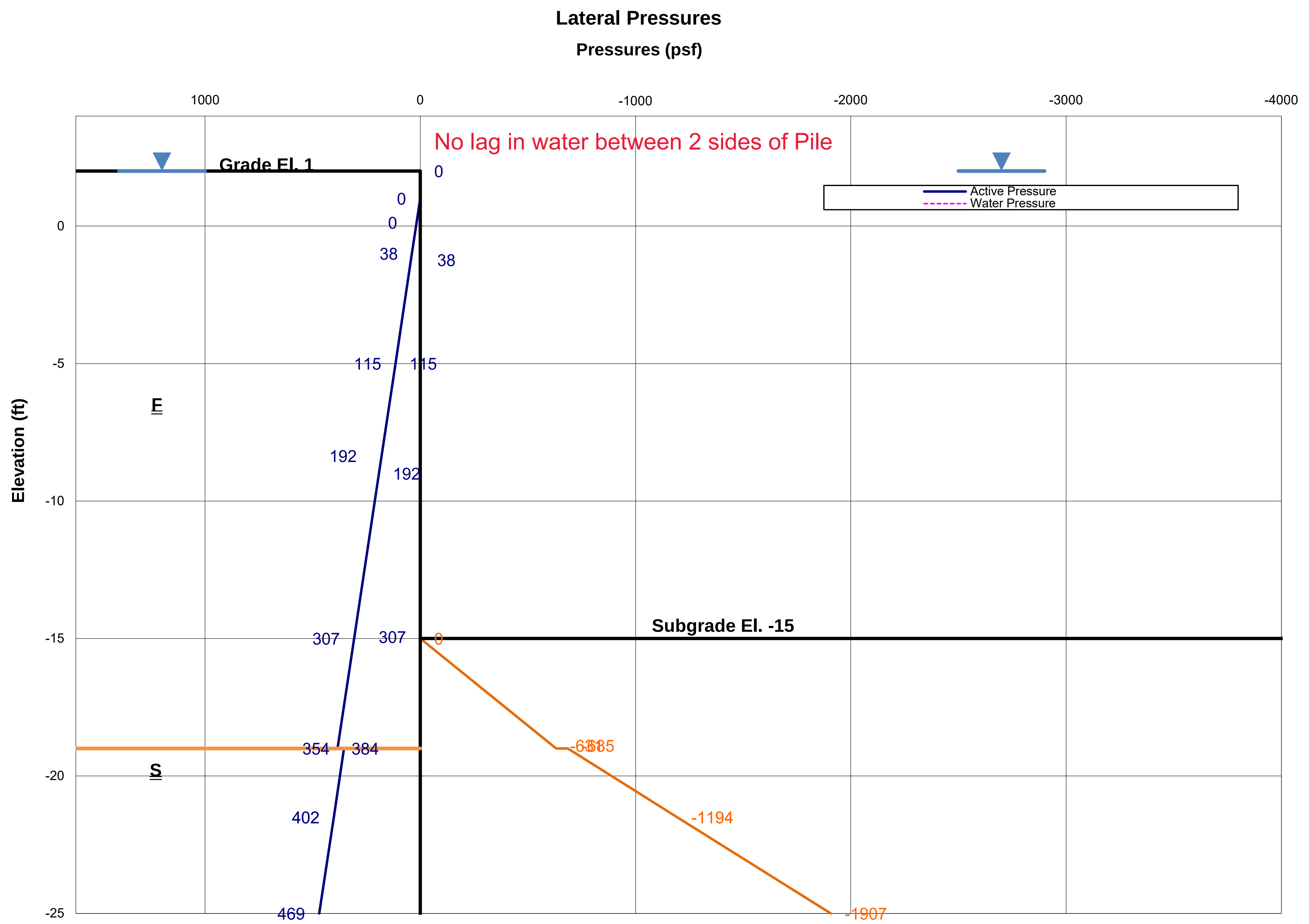
[3] Full passive used for analysis.

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: SK Date: 4/16/2019
Checked By: Date: 4/16/2019

FOR First Street Turning Basin

SUBJECT:	**WEST CLOSURE WALL AT ENTRANCE TO BASIN - SOE STAGING**	**Stage 1**



Net Lateral Pressures

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

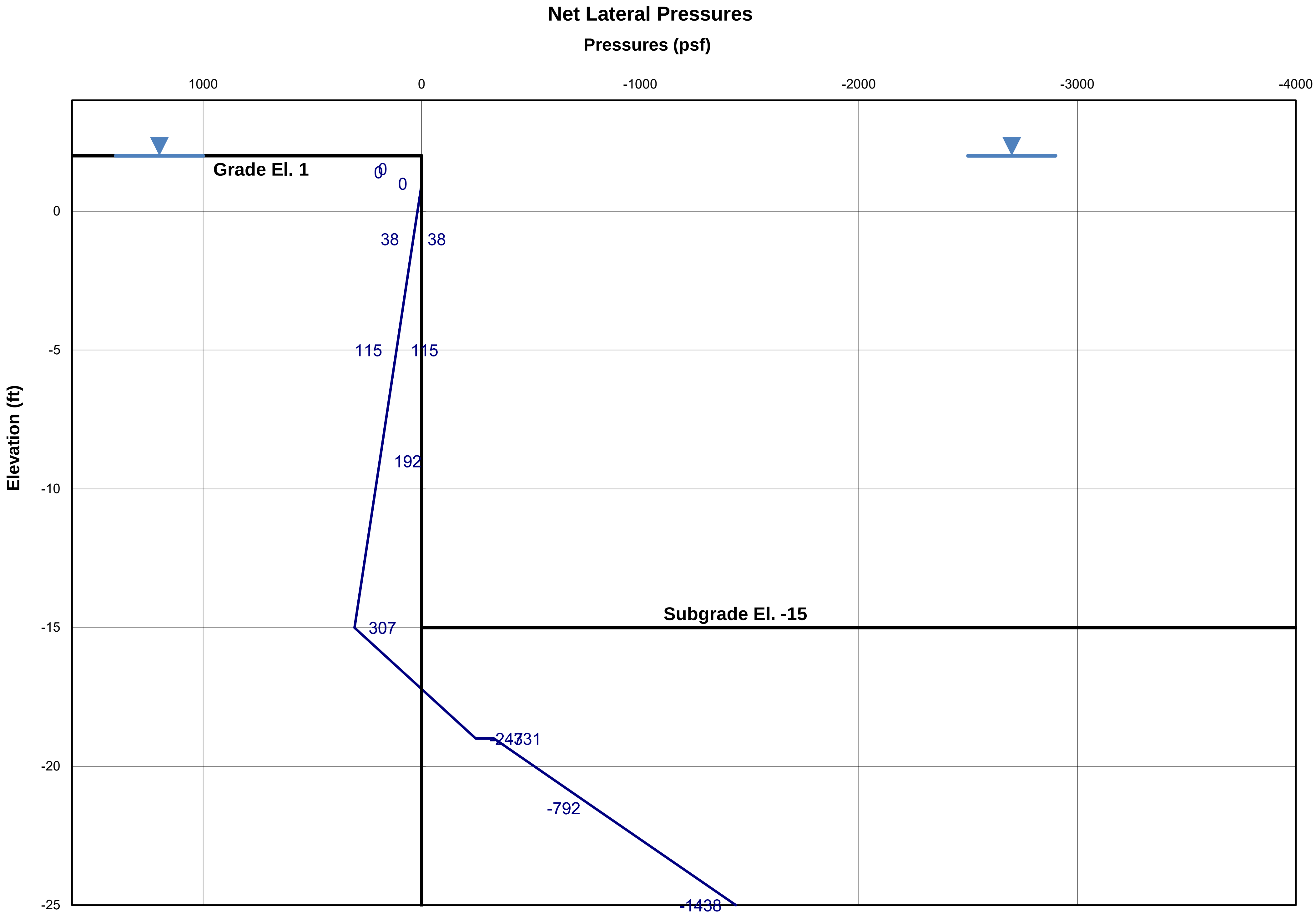
File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin

Checked By: Date: 4/16/2019

SUBJECT: **WEST CLOSURE WALL AT ENTRANCE TO BASIN - SOE STAGING** **Stage 1**



MADE BY: SK
04-16-2019

WEST CLOSURE WALL AT ENTRANCE TO BASIN

MUESER RUTLEDGE CONSULTING ENGINEERS

Cantilever v3.0 BETA for Windows, 32-bit

Subject: Case 1: No lag in water between two sides of pipe pile

INPUT

P	Q	Interval Lengths	
0.000	0.307	17.000	SUBGRADE
0.307	-0.247	4.000	

Passive pressure at subgrade : .331
Passive pressure slope : .184
Flexural rigidity : 293724

OUTPUT

At end of int. 1, Shear= 2.61, Moment= 14.79
At end of int. 2, Shear= 2.73, Moment= 26.20

D= 10.60 embedment below subgrade with F.S.= 1

Total Length of sheetpile is 31.60

Depth of max. moment= 24.94
Max. moment= 32.51

Depth of max. shear= 31.60
Max. shear= 11.11

WITH FS=1.44
EMBEDMENT DEPTH 'D'
$= 1.44\,(4' + 10.6')$
$= 21'$
TIP EL = EL−15−21' = EL−36

X	V	M	Defl.
0.00	0.00	0.00	0.03
1.58	0.02	0.01	0.03
3.16	0.09	0.09	0.03
4.74	0.20	0.32	0.02
6.32	0.36	0.76	0.02
7.90	0.56	1.48	0.02
9.48	0.81	2.56	0.02
11.06	1.10	4.07	0.02
12.64	1.44	6.08	0.01
14.22	1.83	8.65	0.01
15.80	2.25	11.87	0.01
17.38	2.72	15.80	0.01
18.96	2.95	20.31	0.01
20.54	2.83	24.92	0.00
22.12	2.24	29.01	0.00
23.70	1.17	31.76	0.00
25.28	-0.37	32.45	0.00
26.86	-2.37	30.35	0.00
28.44	-4.82	24.73	0.00
30.02	-7.74	14.87	0.00
31.60	-11.11	0.05	0.00

```
   Moment   (M/Mmax)

   -1.0           -0.5            0.0            0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  1.6                              |:
  3.2                              |:
  4.7                              |:
  6.3                              |:
  7.9                              |:
  9.5                              | :
 11.1                              |   :
 12.6                              |     :
 14.2                              |       :
 15.8                              |          :
 17.4                              |              :
 19.0                              |                  :
 20.5                              |                      :
 22.1                              |                          :
 23.7                              |                            :
 25.3                              |                             :
 26.9                              |                           :
 28.4                              |                      :
 30.0                              |             :
 31.6                              |:

   Shear   (V/Vmax)

   -1.0           -0.5            0.0            0.5             1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  1.6                              |:
  3.2                              |:
  4.7                              |:
  6.3                              |:
  7.9                              | :
  9.5                              | :
 11.1                              |  :
 12.6                              |   :
 14.2                              |    :
 15.8                              |     :
 17.4                              |      :
 19.0                              |       :
 20.5                              |       :
 22.1                              |     :
 23.7                              |  :
 25.3                             :|
 26.9                       :      |
 28.4                :             |
 30.0         :                    |
 31.6:                             |
```

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin Checked By: Date: 4/16/2019

SUBJECT: **WEST CLOSURE WALL AT ENTRANCE TO BASIN - SOE STAGING** **Stage 1**

Lateral Earth Pressures: Stage 2: Excavate to EL. -15.0 with 2 ft. lag in water on either side of pipe piles.

	DRIVING FORCES										RESISTING FORCES								
Layer [1]	Elev	H	γ	σ_v	k_a	c	R_a	Active Pressure	600psf Construction Surcharge	Water Pressure	H	γ	σ_v	k_p	R_p	c	Passive Pressure	Net Pressure	Elev
	[ft]	[ft]	[pcf]	[psf]		[psf]		[psf]	(psf)	(psf)	[ft]	[pcf]	[psf]		[psf]	[psf]	[psf]	[psf]	[ft]
	2	0	0	0	0.333		1.00	0		0								0	2
	2	0	0	0	0.333		1.00	0		0								0	2
	1	1	0	0	0.333		1.00	0		62								62	1
	1	0	57.6	0	0.333		1.00	0		62								62	1
	0	1	57.6	58	0.333		1.00	19		125								144	0
F	0	0	57.6	58	0.333		1.00	19		125								144	0
	-5	5	57.6	346	0.333		1.00	115		125								240	-5
	-9	4	57.6	576	0.333		1.00	192		125								317	-9
	-9	0	57.6	576	0.333		1.00	192		125								317	-9
	-15	6	57.6	922	0.333		1.00	307		125								432	-15
	-15	0	57.6	922	0.333		1.00	307		125	0	52.6	0	3.00	1.00		0	432	-15
	-19	4	57.6	1152	0.333		1.00	384		125	4	52.6	210	3.00	1.00		-631	-122	-19
	-19	0	62.6	1152	0.307		1.00	354		125	0	62.6	210	3.25	1.00		-685	-206	-19
S	-21.5	2.5	62.6	1309	0.307		1.00	402		125	2.5	62.6	367	3.25	1.00		-1194	-667	-21.5
	-21.5	0	62.6	1309	0.307		1.00	402		125	0	62.6	367	3.25	1.00		-1194	-667	-21.5
	-25	3.5	62.6	1528	0.307		1.00	469		125	3.5	62.6	586	3.25	1.00		-1907	-1313	-25

Active Pressure: $\sigma_a = \gamma \cdot H \cdot k_a - 2C \cdot \sqrt{k_a}$

Passive Pressure: $\sigma_p = \gamma \cdot H \cdot k_p + 2C \cdot \sqrt{k_p}$

Reduction Factors Applied Below Subgrade :

R_a = 1.000

R_p = 1.000

NOTES:

[1] Coefficient of active and passive earth pressure based on Rankine Theory.

[2] Subgrade slopes from ~El. 0.0 to ~El.-1 .0 so avg. EL. -0.5 used as subgrade

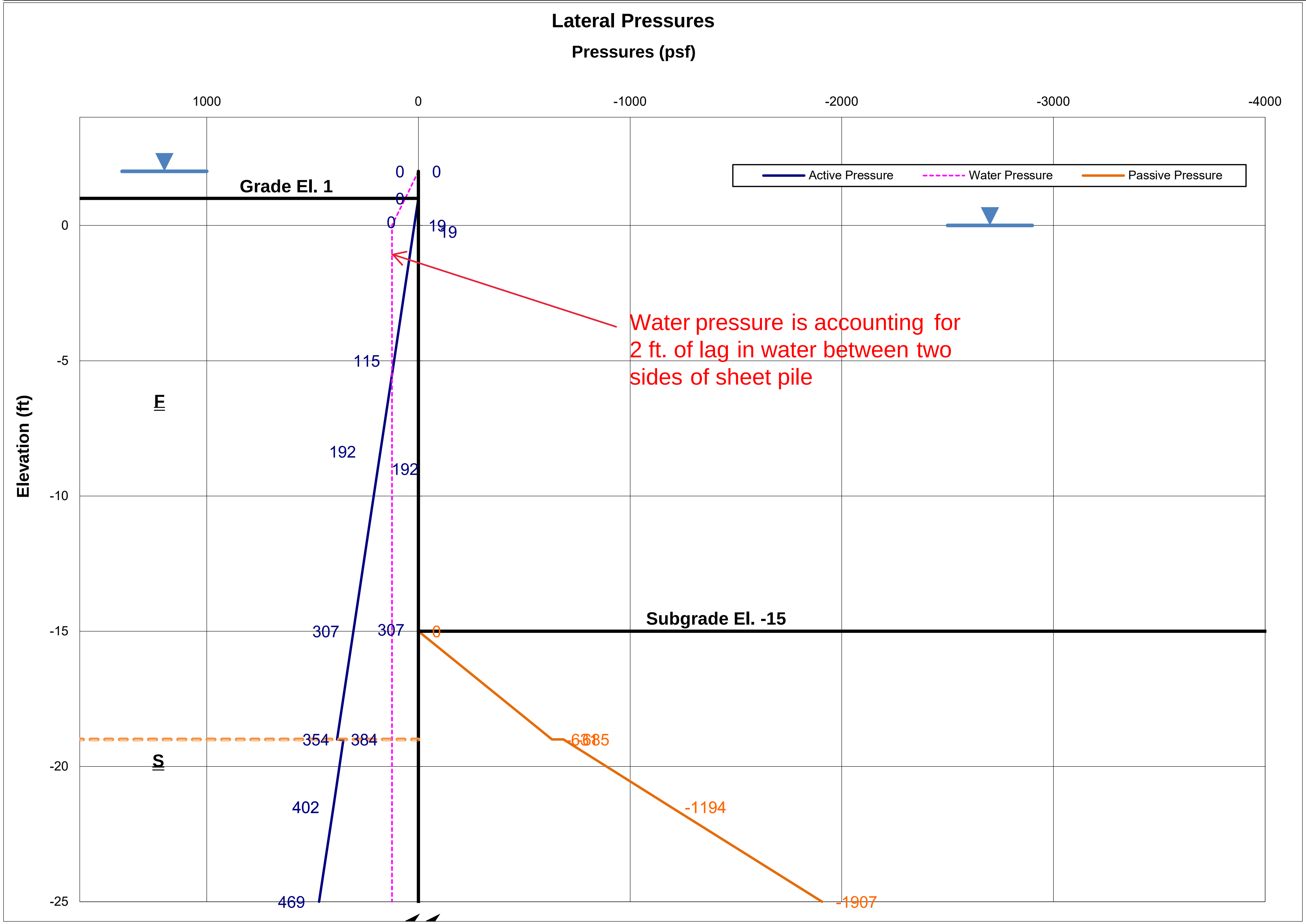
[3] Full passive used for analysis.

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No. _______ of _______
File: 12541
Made By: SK Date: 4/16/2019
Checked By: Date: 4/16/2019

FOR First Street Turning Basin

SUBJECT: **WEST CLOSURE WALL AT ENTRANCE TO BASIN - SOE STAGING** **Stage 1**



Net Lateral Pressures

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

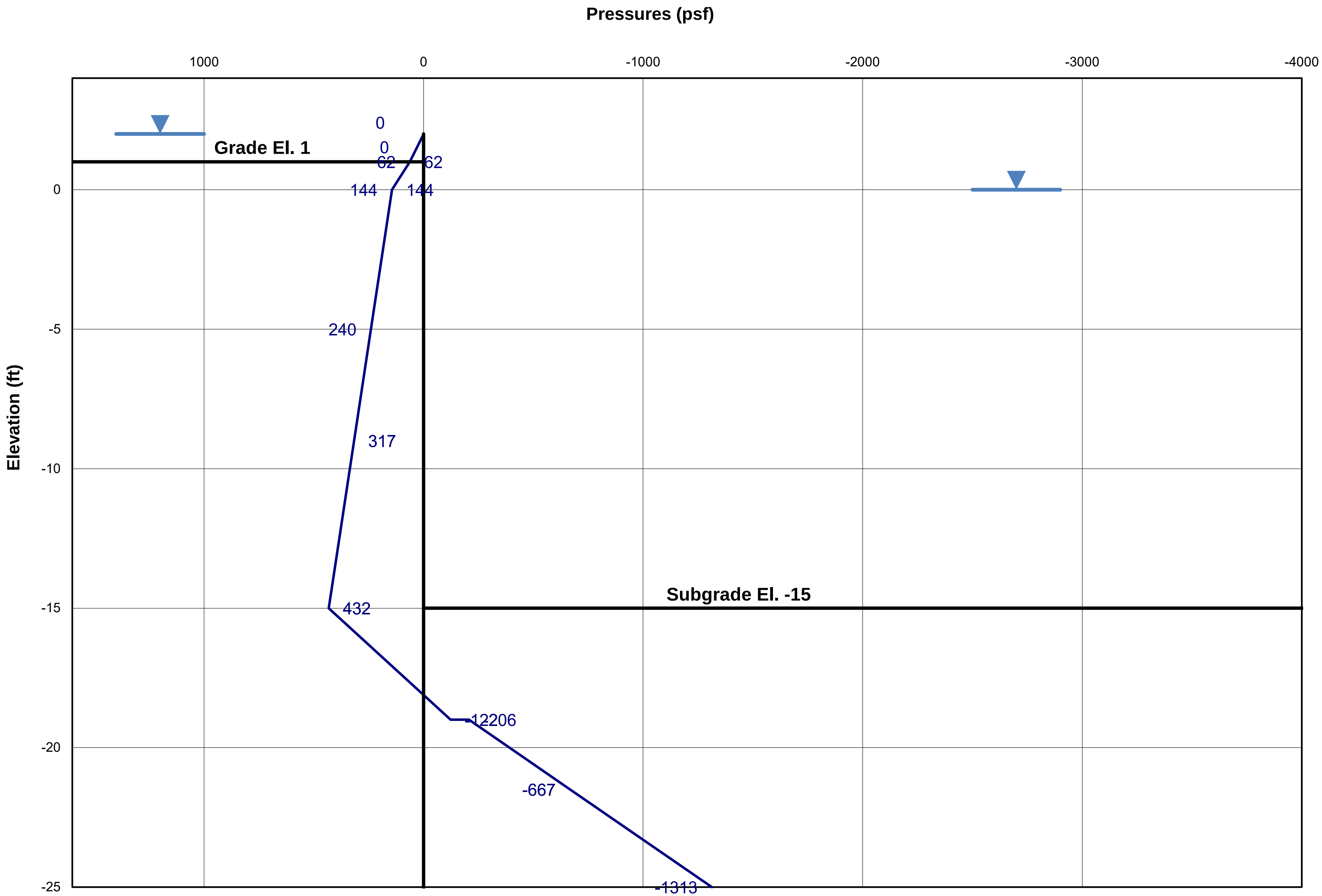
File: 12541

Made By: SK Date: 4/16/2019

FOR First Street Turning Basin Checked By: Date: 4/16/2019

SUBJECT: **WEST CLOSURE WALL AT ENTRANCE TO BASIN - SOE STAGING** **Stage 1**

Net Lateral Pressures



MADE BY: SK
04-16-2019

MUESER RUTLEDGE CONSULTING ENGINEERS

Cantilever v3.0 BETA for Windows, 32-bit

WEST CLOSURE WALL AT ENTRANCE TO BASIN

Subject: Case 2: 2 ft of lag in water between two sides of pile.

INPUT

P	Q	Interval Lengths
0.000	0.062	1.000
0.062	0.144	1.000
0.144	0.432	15.000 SUBGRADE
0.432	-0.122	4.000

Passive pressure at subgrade : .206
Passive pressure slope : .184
Flexural rigidity : 293724

OUTPUT

At end of int. 1, Shear= 0.03, Moment= 0.01
At end of int. 2, Shear= 0.13, Moment= 0.09
At end of int. 3, Shear= 4.45, Moment= 29.10
At end of int. 4, Shear= 5.07, Moment= 48.89

D= 14.91 embedment below subgrade with F.S.= 1

Total Length of sheetpile is 35.91

Depth of max. moment= 27.39
Max. moment= 69.11

Depth of max. shear= 35.91
Max. shear= 18.44

WITH
FS=1.11

EMBEDMENT DEPTH 'D'
= 1.11(4'+14.91')
= 21'

TIP EL= EL-15 - 21' = EL-36.0

X	V	M	Defl.
0.00	0.00	0.00	0.09
1.80	0.11	0.06	0.08
3.59	0.39	0.49	0.08
5.39	0.73	1.49	0.07
7.18	1.14	3.16	0.06
8.98	1.61	5.61	0.06
10.77	2.14	8.96	0.05
12.57	2.73	13.32	0.05
14.36	3.38	18.79	0.04
16.16	4.10	25.50	0.03
17.95	4.80	33.52	0.03
19.75	5.12	42.49	0.02
21.54	4.93	51.62	0.02
23.34	4.09	59.80	0.01
25.13	2.65	65.94	0.01
26.93	0.62	68.96	0.01
28.73	-2.01	67.80	0.00
30.52	-5.23	61.40	0.00
32.32	-9.04	48.68	0.00
34.11	-13.44	28.59	0.00
35.91	-18.44	0.06	0.00

```
   Moment   (M/Mmax)

   -1.0           -0.5            0.0           0.5            1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  1.8                              |:
  3.6                              |:
  5.4                              |:
  7.2                              |:
  9.0                              | :
 10.8                              |   :
 12.6                              |     :
 14.4                              |       :
 16.2                              |          :
 18.0                              |              :
 19.7                              |                 :
 21.5                              |                     :
 23.3                              |                         :
 25.1                              |                            :
 26.9                              |                             :
 28.7                              |                            :
 30.5                              |                          :
 32.3                              |                    :
 34.1                              |           :
 35.9                              |:
```

```
   Shear   (V/Vmax)

   -1.0           -0.5            0.0           0.5            1.0
X(ft)+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0.0                              :
  1.8                              |:
  3.6                              |:
  5.4                              |:
  7.2                              | :
  9.0                              |  :
 10.8                              |  :
 12.6                              |   :
 14.4                              |    :
 16.2                              |      :
 18.0                              |       :
 19.7                              |       :
 21.5                              |       :
 23.3                              |      :
 25.1                              |   :
 26.9                              |:
 28.7                          :   |
 30.5                     :        |
 32.3               :              |
 34.1        :                     |
 35.9:                             |
```

BRACING DESIGN

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC Date: 12/13/2018

FOR First Street Turning Basin

Checked By: Date:

SUBJECT: **Bracing analysis summary**

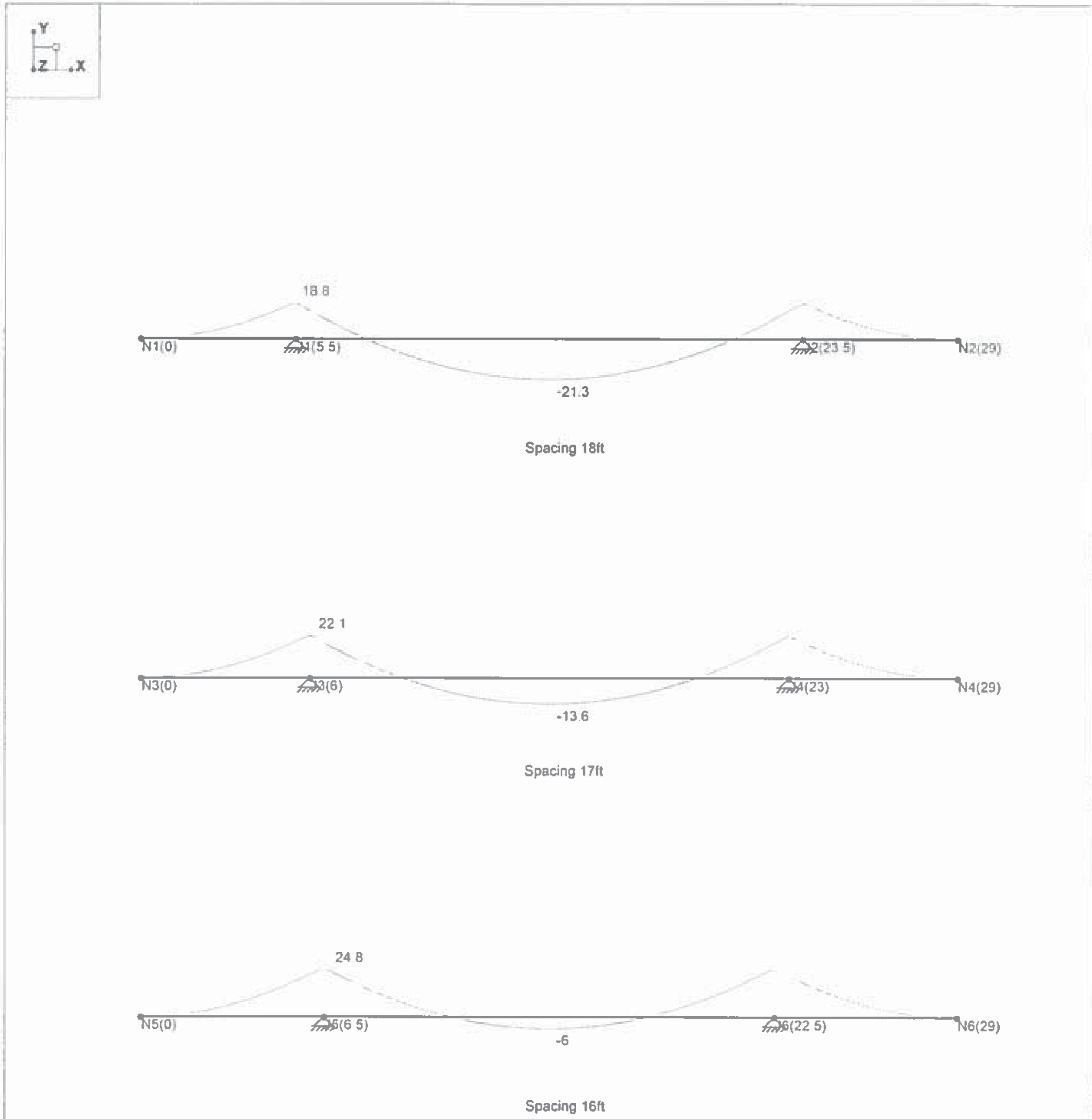
	SECTION / STAGE	Brace Reaction	Strong Axis Moment	Weak Axis Moment	Max. Axial force	Unbraced length	Moment Capacity x-x	Moment Capacity y-y	Axial Capacity	D/C ratio	Notes
		-	M_x	M_y	P_{max}	L_b	M_{cx}	M_{cy}	P_c	-	
		k/ft	k*ft/ft	k*ft/ft	k/ft	ft	k*ft/ft	k*ft/ft	k/ft	-	
Temporary bracing	**Strut** **HP14x117** @ EL. +1	25.0	0.0	0.0	400.0	30.0	400.1	227.2	493.7	0.81	L_b=full length
Temporary bracing	**Wale** **HP16x121** @ EL. +1	25.0	516.7	2.5	0.0	16.0	543.2	230.6	884.9	0.96	Strut spacing = 16ft
Permanent bracing Seperated section	**Strut** **HP16x162**	125.0	0.0	0.0	1750.0	15.0	1423.2	1423.2	2216.6	0.79	L_b=half length No strength reduction for liquefaction
Permanent bracing Seperated section	**Wale** **W24x176 w/ conc.**	125.0	2401.1	0.0	0.0	5.5	2849.2	1585.1	5333.2	0.84	Cantilever = 5.5ft No overstress included

TEMPORARY BRACING

CHECKED : SY 11/9/2018

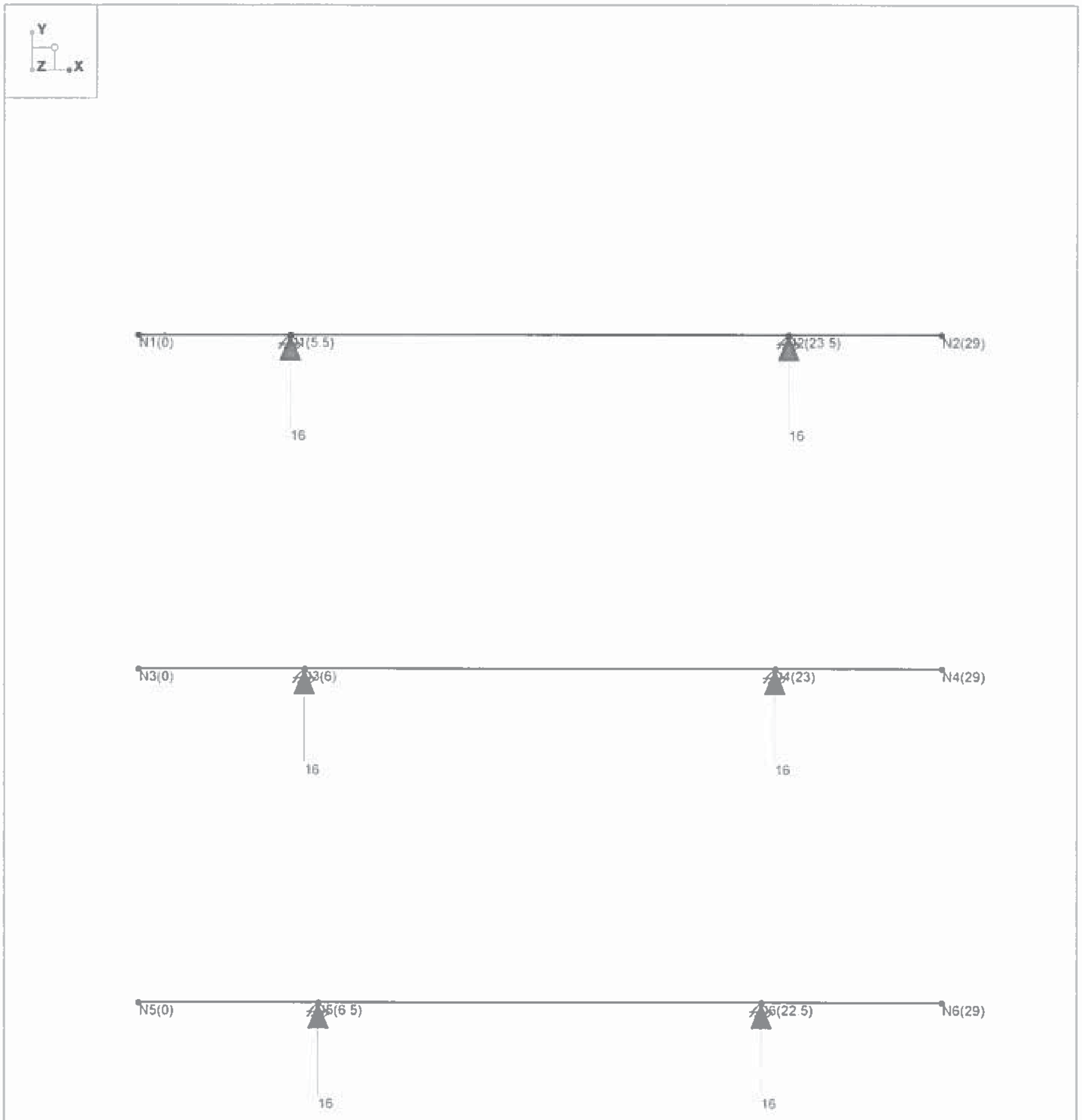
Loads: BLC 1, Brace Unit Load

MRCE	First Street Turning Basin - Bracing El.1	SK - 1
TC	Loading	Nov 9, 2018 at 11:45 AM
12541		1. Brace Analysis Risa.r2d



Results for LC 1, Brace Unit Load
Member Bending Moments (k-ft)

MRCE	First Street Turning Basin - Bracing El.1	SK - 2
TC	Moment	Nov 9, 2018 at 11:46 AM
12541		1. Brace Analysis Risa.r2d



Results for LC 1, Brace Unit Load
Y-direction Reaction Units are k and k-ft

MRCE	First Street Turning Basin - Bracing El.1	SK - 3
TC		Nov 9, 2018 at 11:47 AM
12541	Reaction	1. Brace Analysis Risa.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N3(0)	0	-12	0
2	N4(29)	29	-12	0
3	J3(6)	6	-12	0
4	J4(23)	23	-12	0
5	N1(0)	0	0	0
6	N2(29)	29	0	0
7	J1(5.5)	5.5	0	0
8	J2(23.5)	23.5	0	0
9	N5(0)	0	-24	0
10	N6(29)	29	-24	0
11	J5(6.5)	6.5	-24	0
12	J6(22.5)	22.5	-24	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N3(0)			
2	N4(29)			
3	J3(6)	Reaction	Reaction	
4	J4(23)	Reaction	Reaction	
5	J1(5.5)	Reaction	Reaction	
6	J2(23.5)	Reaction	Reaction	
7	J5(6.5)	Reaction	Reaction	
8	J6(22.5)	Reaction	Reaction	

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	W2	N3(0)	N4(29)		HP16x121	Beam	Wide Flange	A36 Gr.36	Typical
2	W1	N1(0)	N2(29)		HP16x121	Beam	Wide Flange	A36 Gr.36	Typical
3	W3	N5(0)	N6(29)		HP16x121	Beam	Wide Flange	A36 Gr.36	Typical

Member Distributed Loads (BLC 1 : Brace Unit Load)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	W2	Y	-1.25	-1.25	0	6
2	W2	Y	-1	-1	6	23
3	W2	Y	-1.25	-1.25	23	29
4	W1	Y	-1.27	-1.27	23.5	29
5	W1	Y	-1.27	-1.27	0	5.5
6	W1	Y	-1	-1	5.5	23.5
7	W3	Y	-1	-1	6.5	22.5
8	W3	Y	-1.23	-1.23	0	6.5
9	W3	Y	-1.23	-1.23	22.5	29

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	Brace Unit Load	None					9

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	Brace Unit Load	Yes			1	1																		

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	J3(6)	0	16	0
2	1	J4(23)	0	16	0
3	1	J1(5.5)	0	15.985	0
4	1	J2(23.5)	0	15.985	0
5	1	J5(6.5)	0	15.995	0
6	1	J6(22.5)	0	15.995	0

Company	: MRCE	Dec 13, 2018
Designer	: TC	7:57 PM
Job Number	: 12541	Checked By: SK
Model Name	: First Street Turning Basin - Bracing El.1	

Joint Reactions (By Combination) (Continued)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
7	1	Totals:	0	95.96	
8	1	COG (ft):	X: 14.5	Y: -12.003	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	W2	1	0	0	0
2			2	0	7.25	12.657
3			3	0	0	-13.625
4			4	0	-7.25	12.657
5			5	0	0	0
6	1	W1	1	0	0	0
7			2	0	7.25	4.994
8			3	0	0	-21.291
9			4	0	-7.25	4.994
10			5	0	0	0
11	1	W3	1	0	0	0
12			2	0	7.25	20.268
13			3	0	0	-6.016
14			4	0	-7.25	20.268
15			5	0	0	0

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	W2	HP16x121	- P-Delta analysis required for all AISC 360-10 Lo...								
2	1	W1	HP16x121	- P-Delta analysis required for all AISC 360-10 Lo...								
3	1	W3	HP16x121	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...

No Data to Print ...

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...

No Data to Print ...

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	N3(0)	0	-.008	1.231e-04
2	1	N4(29)	0	-.008	-1.231e-04
3	1	J3(6)	0	0	-5.254e-05
4	1	J4(23)	0	0	5.254e-05
5	1	N1(0)	0	.009	-1.363e-04
6	1	N2(29)	0	.009	1.363e-04
7	1	J1(5.5)	0	0	-2.737e-04
8	1	J2(23.5)	0	0	2.737e-04
9	1	N5(0)	0	-.027	3.65e-04
10	1	N6(29)	0	-.027	-3.65e-04
11	1	J5(6.5)	0	0	1.452e-04
12	1	J6(22.5)	0	0	-1.452e-04

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	W2	I	0	0	0
2			J	0	0	0
3	1	W1	I	0	0	0
4			J	0	0	0
5	1	W3	I	0	0	0
6			J	0	0	0

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	W2	1	0	0	0	0
2			2	0	.612	-.755	.755
3			3	0	0	.812	-.812
4			4	0	-.612	-.755	.755
5			5	0	0	0	0
6	1	W1	1	0	0	0	0
7			2	0	.612	-.298	.298
8			3	0	0	1.269	-1.269
9			4	0	-.612	-.298	.298
10			5	0	0	0	0
11	1	W3	1	0	0	0	0
12			2	0	.612	-1.208	1.208
13			3	0	0	.359	-.359
14			4	0	-.612	-1.208	1.208

Member Section Stresses (Continued)

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
15			5	0	0	0	0

Temporary strut

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC   Date : 11/12/2018

For : FIRST STREET TURNING BASIN   Checked By: SK   Date : 11/14/2018

Subject: **Strut @ El. 1**

Beam Steel   **Design Method:** ◉ ASD - 14th Ed. ○ LRFD - 14th Ed. ○ ASD - 9th Ed. ○ AASHTO

Add Self Weight: No

**** DATA INPUT **** (Enter unfactored loads for ASD and factored loads for LRFD and AASHTO)

Axial Force	P (kips):	400.0	= 25x16
Bending Moment	Mx (kip-ft):	0.0	
Bending Moment	My (kip-ft):	0.0	
Shear (weak axis)	Vx (kips):	0.0	
Shear (strong axis)	Vy (kips):	0.0	
Unbraced Length	Lx (ft):	30.00	
Unbraced Length	Ly (ft):	30.00	Full length
Unsupp.L.compr.flange	Lb (ft):	30.00	
Length Factor	Kx:	1.00	
Length Factor	Ky:	1.00	
Mem Angle w/hor	Alpha (deg):	0.00	
Web angle w/ ver	Beta (deg):	0.00	
Steel Strength	Fy (ksi):	50.00	

Bending Coefficient: Cb = 1.00

**** SECTION PROPERTIES ****

<<<<< **MEMBER IS HP14x117** >>>>>

A (in^2) =	34.40	rts (in) =	4.15
d (in) =	14.20	tw (in) =	0.81
bf (in) =	14.90	tf (in) =	0.81
Sx (in^3) =	172.00	Zx (in^3) =	194.00
Sy (in^3) =	59.50	Zy (in^3) =	91.40

Unbraced Length Criteria

Lp (ft) = 12.68

Lr (ft) = 50.56

**** ANALYSIS RESULTS ****

Computed Moment	Mx (kip-ft):	0.0	Computed Shear	Vx (kip):	0.0
Computed Moment	My (kip-ft):	0.0	Computed Shear	Vy (kip):	0.0
Computed Axial	fa (ksi):	11.63			
Computed Bending	fbx (ksi):	0.00	Computed Shear Stress	fvx (ksi):	0.00
Computed Bending	fby (ksi):	0.00	Computed Shear Stress	fvy (ksi):	0.00

Axial Capacity	Pc (kip):	493.7	P/Pc =	0.81
Bending Capacity	Mcx (kip-ft):	400.1	Mx/Mcx =	0.00
Bending Capacity	Mcy (kip-ft):	227.2	My/Mcy =	0.00
Shear Capacity	Vcx (kip):	215.5	Vx/Vcx =	0.00
Shear Capacity	Vcy (kip):	228.6	Vy/Vcy =	0.00

**** COMBINED LOADING CHECK ****

For P/Pc >= 0.2:

P/Pc + 8/9 * (Mx/Mcx + My/Mcy) = 0.81

Temporary Wale

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS File: 12541

Made By: TC Date : 11/12/2018

For : FIRST STREET TURNING BASIN Checked By: SK Date : 11/14/2018

Subject: **WALE @ El. 1 - Spacing 16ft (20% overstressed included)**

Beam Steel **Design Method:** ◉ ASD - 14th Ed. ○ LRFD - 14th Ed. ○ ASD - 9th Ed. ○ AASHTO

Add Self Weight: No

**** DATA INPUT **** (Enter unfactored loads for ASD and factored loads for LRFD and AASHTO)

Axial Force	P (kips):	0.0	
Bending Moment	Mx (kip-ft):	516.7	= 25 x 24.8/1.2
Bending Moment	My (kip-ft):	2.5	
Shear (weak axis)	Vx (kips):	0.0	
Shear (strong axis)	Vy (kips):	400.0	
Unbraced Length	Lx (ft):	16.00	
Unbraced Length	Ly (ft):	16.00	
Unsupp.L.compr.flange	Lb (ft):	16.00	
Length Factor	Kx:	1.00	
Length Factor	Ky:	1.00	
Mem Angle w/hor	Alpha (deg):	0.00	
Web angle w/ ver	Beta (deg):	0.00	
Steel Strength	Fy (ksi):	50.00	
Bending Coefficient	Cb =	1.00	

**** SECTION PROPERTIES ****

<<<<< MEMBER IS HP16x121 >>>>>

A (in^2) =	35.80	rts (in) =	4.34
d (in) =	15.80	tw (in) =	0.75
bf (in) =	15.90	tf (in) =	0.75
Sx (in^3) =	201.00	Zx (in^3) =	226.00
Sy (in^3) =	63.40	Zy (in^3) =	97.60

Unbraced Length Criteria

Lp (ft) = 13.25

Lr (ft) = 48.70

**** ANALYSIS RESULTS ****

Computed Moment	Mx (kip-ft):	516.7	Computed Shear	Vx (kip):	0.0
Computed Moment	My (kip-ft):	2.5	Computed Shear	Vy (kip):	400.0
Computed Axial	fa (ksi):	0.00			
Computed Bending	fbx (ksi):	30.85	Computed Shear Stress	fvx (ksi):	0.00
Computed Bending	fby (ksi):	0.47	Computed Shear Stress	fvy (ksi):	33.76

Axial Capacity	Pc (kip):	884.9	P/Pc =	0.00
Bending Capacity	Mcx (kip-ft):	543.2	Mx/Mcx =	0.95
Bending Capacity	Mcy (kip-ft):	230.6	My/Mcy =	0.01
Shear Capacity	Vcx (kip):	214.2	Vx/Vcx =	0.00
Shear Capacity	Vcy (kip):	237.0	Vy/Vcy =	1.69

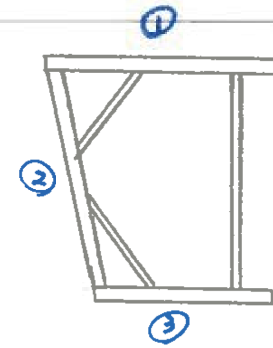
**** COMBINED LOADING CHECK ****

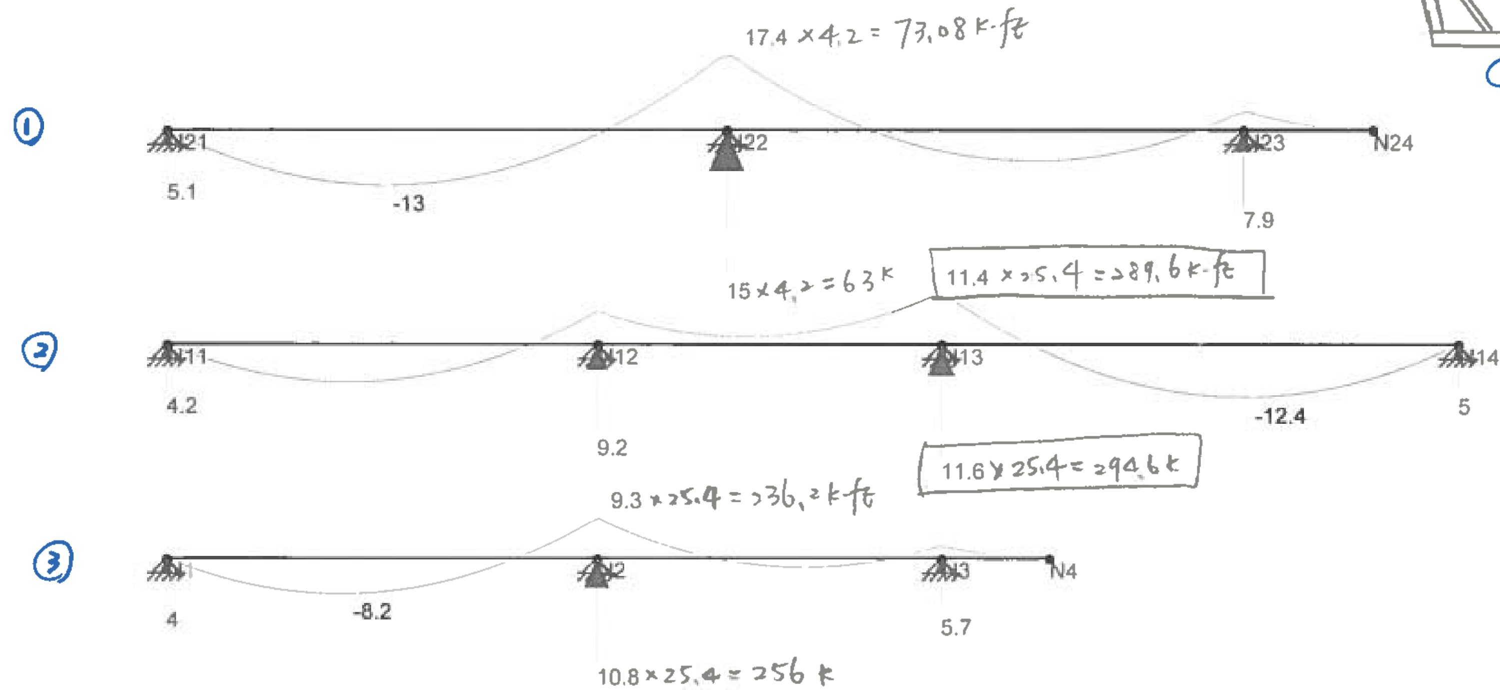
For P/Pc < 0.2:

P/(2*Pc) + (Mx/Mcx + My/Mcy) = 0.96

MADE BY : TC 11/14/18
CHECKED : SK 11/14/18

Refer to west end of temporary bracing on SOE-300.





Results for LC 1, ANCHPULL
Member Bending Moments (k-ft)
Y-direction Reaction Units are k and k-ft

MRCE	East Corner Bracing Moment and reaction	SK - 1
TC		Nov 14, 2018 at 10:06 AM
12541		untitled.r2d

Company	: MRCE		Dec 13, 2018
Designer	: TC		7:58 PM
Job Number	: 12541		Checked By: SK
Model Name	: East Corner Bracing		

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	10	0	0
3	N3	18	0	0
4	N4	20.5	0	0
5	N11	0	5	0
6	N14	30	5	0
7	N12	10	5	0
8	N13	18	5	0
9	N21	0	10	0
10	N22	13	10	0
11	N23	25	10	0
12	N24	28	10	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N2	Reaction	Reaction	
2	N3	Reaction	Reaction	
3	N12	Reaction	Reaction	
4	N13	Reaction	Reaction	
5	N22	Reaction	Reaction	
6	N23	Reaction	Reaction	
7	N1	Reaction	Reaction	
8	N11	Reaction	Reaction	
9	N14	Reaction	Reaction	
10	N21	Reaction	Reaction	

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	N1	N4		HR1A	Beam	None	A36 Gr.36	Typical
2	M2	N11	N14		HR1A	Beam	None	A36 Gr.36	Typical
3	M3	N21	N24		HR1A	Beam	None	A36 Gr.36	Typical

Member Distributed Loads (BLC 1 :)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-1	-1	0	%100
2	M2	Y	-1	-1	0	%100
3	M3	Y	-1	-1	0	%100

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1		None					3

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	ANCHPULL	Yes			1	1																		

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	N2	0	10.752	0
2	1	N3	0	5.701	0
3	1	N12	0	9.216	0
4	1	N13	0	11.577	0
5	1	N22	0	15.049	0
6	1	N23	0	7.854	0
7	1	N1	0	4.048	0
8	1	N11	0	4.225	0
9	1	N14	0	4.982	0
10	1	N21	0	5.096	0

Joint Reactions (By Combination) (Continued)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
11	1	Totals:	0	78.5	
12	1	COG (ft):	X: 13.403	Y: 5.478	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	4.048	0
2			2	0	-1.077	-7.612
3			3	0	4.549	8.352
4			4	0	-.576	-1.83
5			5	0	0	0
6	1	M2	1	0	4.225	0
7			2	0	-3.275	-3.563
8			3	0	-1.559	3.043
9			4	0	2.518	-9.238
10			5	0	-4.982	0
11	1	M3	1	0	5.096	0
12			2	0	-1.904	-11.173
13			3	0	6.146	11.601
14			4	0	-.854	-6.918
15			5	0	0	0

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	M1	W10x33	- P-Delta analysis required for all AISC 360-10 Lo...								
2	1	M2	W10x33	- P-Delta analysis required for all AISC 360-10 Lo...								
3	1	M3	W10x33	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Company	: MRCE	Dec 13, 2018
Designer	: TC	7:58 PM
Job Number	: 12541	Checked By: SK
Model Name	: East Corner Bracing	

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...
No Data to Print ...													

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
No Data to Print ...			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	N1	0	0	-9.702e-04
2	1	N2	0	0	3.268e-04
3	1	N3	0	0	3.943e-05
4	1	N4	0	-.002	-5.51e-05
5	1	N11	0	0	-1.071e-03
6	1	N14	0	0	1.762e-03
7	1	N12	0	0	5.473e-04
8	1	N13	0	0	-8.032e-04
9	1	N21	0	0	-1.937e-03
10	1	N22	0	0	4.03e-04
11	1	N23	0	0	6.761e-04
12	1	N24	0	.018	5.127e-04

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	0	4.048	0
2			J	0	0	0
3	1	M2	I	0	4.225	0
4			J	0	-4.982	0
5	1	M3	I	0	5.096	0
6			J	0	0	0

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	0	1.435	0	0
2			2	0	-.382	2.599	-2.599
3			3	0	1.612	-2.851	2.851
4			4	0	-.204	.625	-.625
5			5	0	0	0	0
6	1	M2	1	0	1.497	0	0
7			2	0	-1.161	1.216	-1.216
8			3	0	-.552	-1.039	1.039
9			4	0	.892	3.154	-3.154
10			5	0	-1.766	0	0
11	1	M3	1	0	1.806	0	0
12			2	0	-.675	3.815	-3.815
13			3	0	2.178	-3.961	3.961
14			4	0	-.303	2.362	-2.362

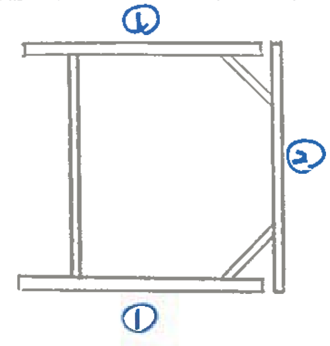
Member Section Stresses (Continued)

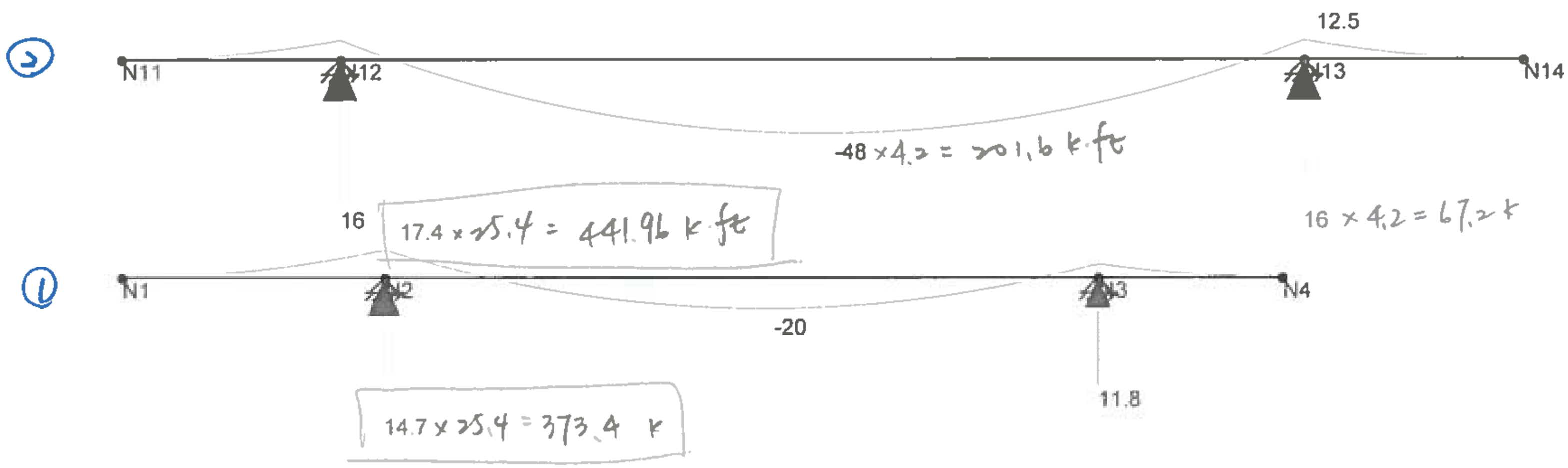
	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
15			5	0	0	0	0

MADE BY: LC 11/14/18
CHECKED: SK 11/14/18

Y
Z X

Refer to East end of temporary bracing on SOE-301.





Results for LC 1, ANCHPULL
Member Bending Moments (k-ft)
Y-direction Reaction Units are k and k-ft

MRCE		SK - 2
TC	West Corner Bracing	Nov 14, 2018 at 10:36 AM
12541	Moment and reaction	West Corner bracing at EL+1.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
	AISC 14th(360-10): ASD

Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	6	0	0
3	N3	22.3	0	0
4	N4	26.5	0	0
5	N11	0	5	0
6	N14	32	5	0
7	N12	5	5	0
8	N13	27	5	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N2	Reaction	Reaction	
2	N3	Reaction	Reaction	
3	N12	Reaction	Reaction	
4	N13	Reaction	Reaction	

Member Primary Data

	Label	I Joint	J Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	N1	N4		HR1A	Beam	None	A36 Gr.36	Typical
2	M2	N11	N14		HR1A	Beam	None	A36 Gr.36	Typical

Member Distributed Loads (BLC 1 :)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-1	-1	0	%100
2	M2	Y	-1	-1	0	%100

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1		None					2

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	ANCHPULL	Yes			1	1																		

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	N2	0	14.713	0
2	1	N3	0	11.787	0
3	1	N12	0	16	0
4	1	N13	0	16	0
5	1	Totals:	0	58.5	
6	1	COG (ft):	X: 14.754	Y: 2.735	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	0	0
2			2	0	8.088	12.753
3			3	0	1.463	-18.886
4			4	0	-5.162	-6.635
5			5	0	0	0
6	1	M2	1	0	0	0
7			2	0	8	-15.998
8			3	0	0	-48
9			4	0	-8	-15.998

Company	: MRCE
Designer	: TC
Job Number	: 12541
Model Name	: West Corner Bracing

Dec 13, 2018
7:58 PM
Checked By: SK

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
10			5	0	0	0

Member Section Deflections Service

LC	Member Label	Sec	x [in]	y [in]	(n) L/y' Ratio
No Data to Print ...					

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member AISC 14th(360-10): ASD Steel Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Pnc/o...	Pnt/o...	Mn/om...	Cb	Eqn
1	1	M1	W10x33	- P-Delta analysis required for all AISC 360-10 Lo...								
2	1	M2	W10x33	- P-Delta analysis required for all AISC 360-10 Lo...								

Concrete Beam Design Parameters

Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
No Data to Print ...									

Concrete Column Design Parameters

Label	Shape	Length[ft]	Lu-out[ft]	Lu-in[ft]	Cm-out	Cm-in	K-out	K-in	Out sw...	In sway	Icr Fac...	Flexur...	Shear ...
No Data to Print ...													

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
No Data to Print ...			

Joint Deflections

	LC	Joint Label	X [in]	Y [in]	Rotation [rad]
1	1	N1	0	.074	-8.035e-04
2	1	N2	0	0	-2.11e-03
3	1	N3	0	0	3.055e-03
4	1	N4	0	.133	2.607e-03
5	1	N11	0	.627	-1.036e-02
6	1	N14	0	.627	1.036e-02
7	1	N12	0	0	-1.111e-02
8	1	N13	0	0	1.111e-02

Member End Reactions

	LC	Member Label	Member E...	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	I	0	0	0
2			J	0	0	0
3	1	M2	I	0	0	0
4			J	0	0	0

Member Section Stresses

	LC	Member Label	Sec	Axial[ksi]	Shear[ksi]	Top Bending[ksi]	Bot Bending[ksi]
1	1	M1	1	0	0	0	0
2			2	0	2.866	-4.354	4.354
3			3	0	.519	6.448	-6.448
4			4	0	-1.829	2.265	-2.265
5			5	0	0	0	0
6	1	M2	1	0	0	0	0
7			2	0	2.835	5.462	-5.462
8			3	0	0	16.387	-16.387
9			4	0	-2.835	5.462	-5.462
10			5	0	0	0	0

SHEET ____ OF ____

MUESER RUTLEDGE CONSULTING ENGINEERS

FILE ____

MADE BY TC DATE 11/14/18

CHECKED BY SK DATE 11/14/18

PROJECT 12541

SUBJECT Corner Bracing reaction calculation

WEST BRACING

①

$$\frac{73.08}{\sin 45} = \underline{103.4 \text{ kips}}$$

②

$$\frac{9.2 \times 25.4}{\sin 58} = 275.6 \text{ kips}$$

$$\frac{11.6 \times 25.4}{\sin 32.24} = \underline{\underline{552.3 \text{ kips}}}$$

③

$$\frac{256}{\sin 45} = 362 \text{ kips}$$

EAST BRACING

①

$$\frac{373.4}{\sin 45} = 528.1 \text{ kips}$$

②

$$\frac{67.2}{\sin 45} = 95.1 \text{ kips}$$

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: TC Date : 11/14/2018

For : FIRST STREET TURNING BASIN Checked By: SH Date : 11/14/18

Subject: **Strut @ El.1 - Corner bracing**

Beam Steel **Design Method:** (●) ASD - 14th Ed. ( ) LRFD - 14th Ed. ( ) ASD - 9th Ed. ( ) AASHTO

Add Self Weight: No

**** DATA INPUT **** (Enter unfactored loads for ASD and factored loads for LRFD and AASHTO)

Axial Force	P (kips):	552.3
Bending Moment	Mx (kip-ft):	0.0
Bending Moment	My (kip-ft):	0.0
Shear (weak axis)	Vx (kips):	0.0
Shear (strong axis)	Vy (kips):	0.0
Unbraced Length	Lx (ft):	16.00
Unbraced Length	Ly (ft):	16.00
Unsupp.L.compr.flange	Lb (ft):	16.00
Length Factor	Kx:	1.00
Length Factor	Ky:	1.00
Mem Angle w/hor	Alpha (deg):	0.00
Web angle w/ ver	Beta (deg):	0.00
Steel Strength	Fy (ksi):	50.00

Bending Coefficient: Cb = 1.00

**** SECTION PROPERTIES ****

<<<<< **MEMBER IS HP14x117** >>>>>

A (in^2) =	34.40	rts (in) =	4.15
d (in) =	14.20	tw (in) =	0.81
bf (in) =	14.90	tf (in) =	0.81
Sx (in^3) =	172.00	Zx (in^3) =	194.00
Sy (in^3) =	59.50	Zy (in^3) =	91.40

Unbraced Length Criteria

Lp (ft) = 12.68

Lr (ft) = 50.56

**** ANALYSIS RESULTS ****

Computed Moment	Mx (kip-ft):	0.0	Computed Shear	Vx (kip):	0.0
Computed Moment	My (kip-ft):	0.0	Computed Shear	Vy (kip):	0.0
Computed Axial	fa (ksi):	16.06			
Computed Bending	fbx (ksi):	0.00	Computed Shear Stress	fvx (ksi):	0.00
Computed Bending	fby (ksi):	0.00	Computed Shear Stress	fvy (ksi):	0.00

Axial Capacity	Pc (kip):	835.6	P/Pc =	0.66
Bending Capacity	Mcx (kip-ft):	467.9	Mx/Mcx =	0.00
Bending Capacity	Mcy (kip-ft):	227.2	My/Mcy =	0.00
Shear Capacity	Vcx (kip):	215.5	Vx/Vcx =	0.00
Shear Capacity	Vcy (kip):	228.6	Vy/Vcy =	0.00

**** COMBINED LOADING CHECK ****

For P/Pc >= 0.2:

P/Pc + 8/9 * (Mx/Mcx + My/Mcy) = 0.66

Sheet No. ______ of ______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541
Made By: TC | Date : 11/14/2018
For : FIRST STREET TURNING BASIN | Checked By: SK | Date : 11/14/2018

Subject: **WALE @ El. 1 - Corner bracing**

Beam Steel | **Design Method:** ◉ ASD - 14th Ed. ○ LRFD - 14th Ed. ○ ASD - 9th Ed. ○ AASHTO

Add Self Weight: No

**** DATA INPUT **** (Enter unfactored loads for ASD and factored loads for LRFD and AASHTO)

Axial Force	P (kips):	0.0
Bending Moment	Mx (kip-ft):	442.0
Bending Moment	My (kip-ft):	2.5
Shear (weak axis)	Vx (kips):	0.0
Shear (strong axis)	Vy (kips):	373.4
Unbraced Length	Lx (ft):	21.00
Unbraced Length	Ly (ft):	21.00
Unsupp.L.compr.flange	Lb (ft):	21.00
Length Factor	Kx:	1.00
Length Factor	Ky:	1.00
Mem Angle w/hor	Alpha (deg):	0.00
Web angle w/ ver	Beta (deg):	0.00
Steel Strength	Fy (ksi):	50.00

Bending Coefficient: Cb = 1.00

**** SECTION PROPERTIES ****

<<<<< **MEMBER IS HP16x121** >>>>>

A (in^2) =	35.80	rts (in) =	4.34		
d (in) =	15.80	tw (in) =	0.75	Lp (ft) =	13.25
bf (in) =	15.90	tf (in) =	0.75	Lr (ft) =	48.70
Sx (in^3) =	201.00	Zx (in^3) =	226.00		
Sy (in^3) =	63.40	Zy (in^3) =	97.60		

Unbraced Length Criteria (Lp, Lr above)

**** ANALYSIS RESULTS ****

Computed Moment	Mx (kip-ft):	442.0	Computed Shear	Vx (kip):	0.0
Computed Moment	My (kip-ft):	2.5	Computed Shear	Vy (kip):	373.4
Computed Axial	fa (ksi):	0.00			
Computed Bending	fbx (ksi):	26.39	Computed Shear Stress	fvx (ksi):	0.00
Computed Bending	fby (ksi):	0.47	Computed Shear Stress	fvy (ksi):	31.51

Axial Capacity	Pc (kip):	770.4	P/Pc =	0.00
Bending Capacity	Mcx (kip-ft):	517.3	Mx/Mcx =	0.85
Bending Capacity	Mcy (kip-ft):	230.6	My/Mcy =	0.01
Shear Capacity	Vcx (kip):	214.2	Vx/Vcx =	0.00
Shear Capacity	Vcy (kip):	237.0	Vy/Vcy =	1.58

**** COMBINED LOADING CHECK ****

For P/Pc < 0.2:

P/(2*Pc) + (Mx/Mcx + My/Mcy) = 0.87

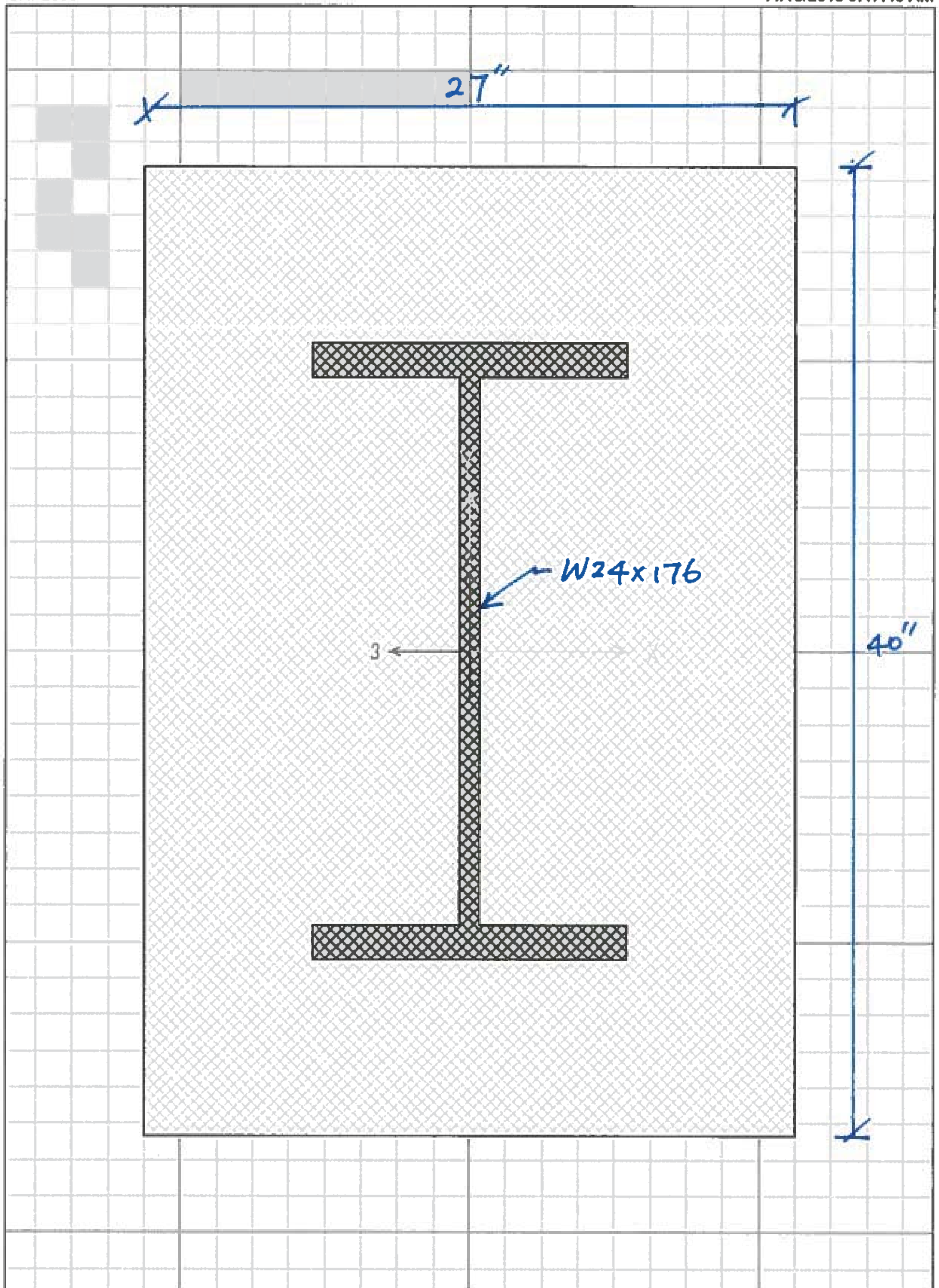
PERMANENT BRACING

MADE BY: TC 11/13

Composite section of permanent wale

CHECKED
SK 11/13/18

SAP2000 11/13/2018 9:47:43 AM



W24x192 (Untitled) Kip, in, F

MADE BY : TC 11/13/1(

Property Data

Section Name	W24x176

Properties

Cross-section (axial) area	179.3198	Section modulus about 3 axis	1141.9538
Moment of Inertia about 3 axis	22839.076	Section modulus about 2 axis	635.2975
Moment of Inertia about 2 axis	8576.5166	Plastic modulus about 3 axis	1330.9319
Product of Inertia about 2-3	0.	Plastic modulus about 2 axis	688.6886
Shear area in 2 direction	130.3187	Radius of Gyration about 3 axis	11.2856
Shear area in 3 direction	153.6714	Radius of Gyration about 2 axis	6.9158
Torsional constant	21650.16	Shear Center Eccentricity (x3)	0.

OK

SHEET ____ OF ____

FILE ____

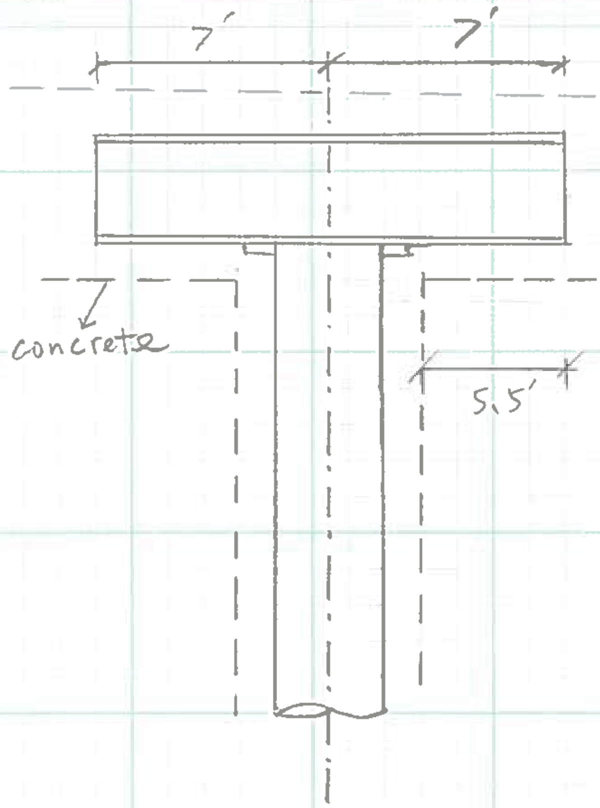
MUESER RUTLEDGE CONSULTING ENGINEERS

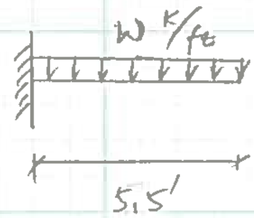
MADE BY TC DATE 11/12/18

CHECKED BY SK DATE 11/13/18

PROJECT 12541

SUBJECT PERMANENT BRACING - SEPERATED SECTION





ASSUME CANTILEVER ON EACH SIDE OF THE WALE TO DETERMINE MOMENT AND SHEAR

GAP BETWEEN WALE = 3 ft

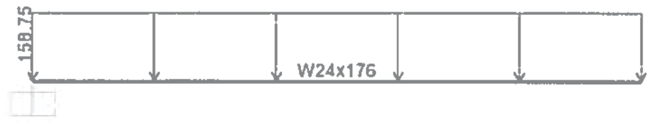
$$w = \frac{1 \times (5.5 + 3/2)}{5.5} = 1.27 \text{ k/ft} \rightarrow W = 125 \times 1.27 = 158.8 \text{ k/ft}$$

$$M = \frac{158.8 \times 5.5^2}{2} = 2401.1 \text{ k-ft}$$

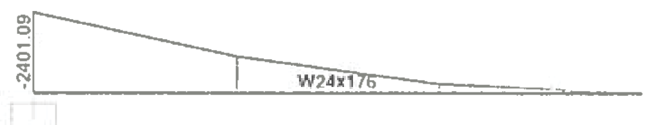
$$V = 158.8 \times 5.5 = 871.75 \text{ kips}$$

Reaction for strut $= 871.75 \times 2 = 1743.5$ kips

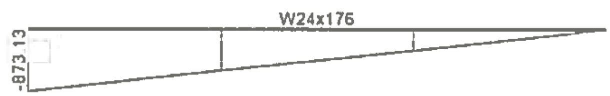
MADE BY: TC 11/13/18



Live load from anchored wall



Moment Diagram



Shear Diagram

CHECKED
SK 11/13/18

Project First Turning Basin
Job Number 12541
Engineer TC

SAP2000

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AISC 360-10 STEEL SECTION CHECK  (Summary for Combo and Station)
Units  : Kip, ft, F

Frame : 2           X Mid: -5.250      Combo: COMB1           Design Type: Beam
Length: 5.500       Y Mid: 0.000       Shape: W24x176         Frame Type: SMF
Loc   : 0.000       Z Mid: 0.000       Class: Non-Compact     Princpl Rot: 0.000 degrees

Provision: ASD      Analysis: Direct Analysis
D/C Limit=0.950     2nd Order: General 2nd Order      Reduction: Tau-b Fixed
AlphaPr/Py=0.000    AlphaPr/Pe=0.000  Tau_b=1.000     EA factor=0.800   EI factor=0.800

OmegaB=1.670        OmegaC=1.670      OmegaTY=1.670   OmegaTF=2.000
OmegaV=1.670        OmegaV-RI=1.500   OmegaVT=1.670

A=1.245             I33=1.101         r33=0.940       S33=0.661         Av3=1.067
J=1.044             I22=0.414         r22=0.576       S22=0.368         Av2=0.905
E=4175999.751       fy=7200.000       Ry=1.100        z33=0.770
RLLF=1.000          Fu=9359.999                       z22=0.399


STRESS CHECK FORCES & MOMENTS  (Combo COMB1)
    Location            Pr        Mr33        Mr22         Vr2         Vr3          Tr
    0.000            0.000   -2401.094       0.000    -873.125       0.000       0.000

PMM DEMAND/CAPACITY RATIO    (H1-1b)
    D/C Ratio:    0.843 = 0.000 + 0.843 + 0.000
                        = (1/2)(Pr/Pc) + (Mr33/Mc33) + (Mr22/Mc22)

AXIAL FORCE & BIAXIAL MOMENT DESIGN   (H1-1b)
    Factor                   L          K1          K2          B1          B2          Cm
    Major Bending        1.000       1.000       1.000       1.000       1.000       1.000
    Minor Bending        1.000       1.000       1.000       1.000       1.000       1.000

                          Lltb        Kltb          Cb
    LTB                  1.000       1.000       2.228

                            Pr   Pnc/Omega   Pnt/Omega
                         Force    Capacity    Capacity
    Axial                0.000    5333.222    5368.856

                            Mr    Mn/Omega    Mn/Omega    Mn/Omega
                        Moment    Capacity      No LTB        Cb=1
    Major Moment     -2401.094    2849.186    2849.186    2849.186
    Minor Moment         0.000    1585.074

SHEAR CHECK
                            Vr    Vn/Omega      Stress      Status
                         Force    Capacity       Ratio       Check
    Major Shear        873.125    2341.054       0.373          OK
    Minor Shear          0.000    2760.564       0.000          OK

CONNECTION SHEAR FORCES FOR BEAMS
                        VMajor      VMajor
                          Left       Right
    Major (V2)         873.125       0.000
```

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SAP2000 Analysis Report

Prepared by
TC/SK

Model Name: composite section_seperate.sdb

14 December 2018

Contents

List of Figures

List of Tables

1. Model geometry

This section provides model geometry information, including items such as joint coordinates, joint restraints, and element connectivity.

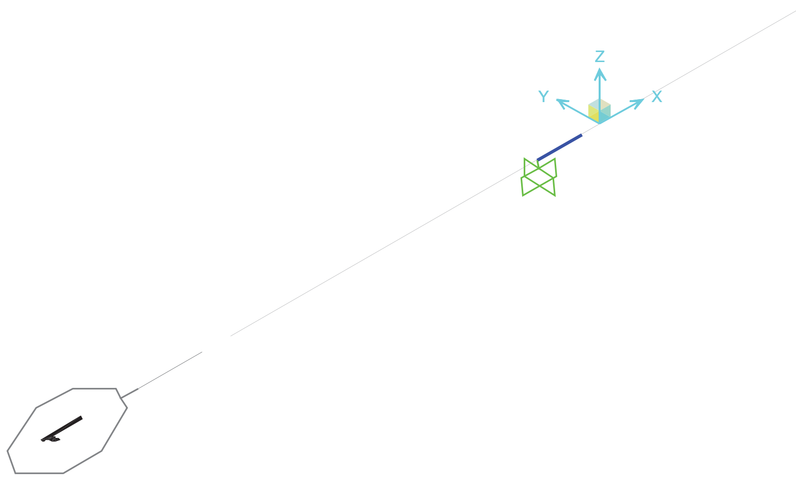


Figure 1: Finite element model

1.1. Joint coordinates

Table 1: Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			in	in	in
2	GLOBAL	Cartesian	-96.	0.	0.
3	GLOBAL	Cartesian	-30.	0.	0.

1.2. Joint restraints

Table 2: Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
2	Yes	Yes	Yes	Yes	Yes	Yes

1.3. Element connectivity

Table 3: Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length
			in
2	2	3	66.

Table 4: Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
2	W24x176	W24x176	Default

2. Material properties

This section provides material property information for materials used in the model.

Table 5: Material Properties 02 - Basic Mechanical Properties

Table 5: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight	UnitMass	E1	G12	U12	A1
	Kip/in3	Kip-s2/in4	Kip/in2	Kip/in2		1/F
4000Psi	8.6806E-05	2.2483E-07	3604.997	1502.082	0.2	5.5000E-06
A416Gr270	2.8356E-04	7.3446E-07	28500.			6.5000E-06
A615Gr60	2.8356E-04	7.3446E-07	29000.			6.5000E-06
A992Fy50	2.8356E-04	7.3446E-07	29000.	11153.846	0.3	6.5000E-06

Table 6: Material Properties 03a - Steel Data

Table 6: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope
	Kip/in2	Kip/in2	
A992Fy50	50.	65.	-0.1

Table 7: Material Properties 03b - Concrete Data

Table 7: Material Properties 03b - Concrete Data

Material	Fc	eFc	FinalSlope
	Kip/in2	Kip/in2	
4000Psi	4.	4.	-0.1

Table 8: Material Properties 03e - Rebar Data

Table 8: Material Properties 03e - Rebar Data

Material	Fy	Fu	FinalSlope
	Kip/in2	Kip/in2	
A615Gr60	60.	90.	-0.1

Table 9: Material Properties 03f - Tendon Data

Table 9: Material Properties 03f - Tendon Data

Material	Fy	Fu	FinalSlope
	Kip/in2	Kip/in2	
A416Gr270	245.1	270.	-0.1

3. Section properties

This section provides section property information for objects used in the model.

3.1. Frames

Table 10: Frame Section Properties 01 - General, Part 1 of 4

Table 10: Frame Section Properties 01 - General, Part 1 of 4

SectionName	Material	Shape	t3	t2	tf	tw	t2b	tfb
			in	in	in	in	in	in
FSEC1	A992Fy50	I/Wide Flange	12.	5.	0.38	0.25	5.	0.38
FSEC2	A992Fy50	SD Section						
W24x176	A992Fy50	SD Section						

Table 10: Frame Section Properties 01 - General, Part 2 of 4

Table 10: Frame Section Properties 01 - General, Part 2 of 4

SectionName	Area	TorsConst	I33	I22	I23	AS2	AS3
	in2	in4	in4	in4	in4	in2	in2
FSEC1	6.61	0.23	157.9	7.93	0.	3.	3.17
FSEC2	248.65	47526.35	47471.06	18716.85	0.	187.89	211.44
W24x176	179.32	21650.16	22839.08	8576.52	0.	130.32	153.67

Table 10: Frame Section Properties 01 - General, Part 3 of 4

Table 10: Frame Section Properties 01 - General, Part 3 of 4

SectionName	S33	S22	Z33	Z22	R33	R22
	in3	in3	in3	in3	in	in
FSEC1	26.32	3.17	29.97	4.93	4.8876	1.0954
FSEC2	1949.53	1134.35	2180.9	1187.13	13.8172	8.6761
W24x176	1141.95	635.3	1330.93	688.69	11.2856	6.9158

Table 10: Frame Section Properties 01 - General, Part 4 of 4

Table 10: Frame Section Properties 01 - General, Part 4 of 4

SectionName	AMod	A2Mod	A3Mod	JMod	I2Mod	I3Mod	MMod	WMod
FSEC1	1.	1.	1.	1.	1.	1.	1.	1.
FSEC2	1.	1.	1.	1.	1.	1.	1.	1.
W24x176	1.	1.	1.	1.	1.	1.	1.	1.

Table 11: Frame Property Modifiers, Part 1 of 2

Table 11: Frame Property Modifiers, Part 1 of 2

Frame	AMod	AS2Mod	AS3Mod	JMod	I22Mod	I33Mod	MassMod	WeightMod
2	1.	1.	1.	1.	1.	1.	1.	1.

Table 11: Frame Property Modifiers, Part 2 of 2

Table 11: Frame Property Modifiers, Part 2 of 2

Frame	EAModifier	EIModifier
2	0.8	0.8

3.2. Solids

Table 12: Solid Property Definitions

Table 12: Solid Property Definitions

SolidProp	Material	MatAngleA	MatAngleB	MatAngleC
		Degrees	Degrees	Degrees
Solid1	4000Psi	0.	0.	0.

4. Load patterns

This section provides loading information as applied to the model.

4.1. Definitions

Table 13: Load Pattern Definitions

Table 13: Load Pattern Definitions

LoadPat	DesignType	SelfWtMult	AutoLoad
DEAD	Dead	1.	
bracing	Live	0.	

5. Load cases

This section provides load case information.

5.1. Definitions

Table 14: Load Case Definitions, Part 1 of 2

Table 14: Load Case Definitions, Part 1 of 2

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesActOpt
DEAD	LinStatic	Zero				Prog Det
MODAL	LinModal	Zero				Prog Det
bracing	LinStatic	Zero				Prog Det

Table 14: Load Case Definitions, Part 2 of 2

Table 14: Load Case Definitions, Part 2 of 2

Case	DesignAct
DEAD	Non-Composite
MODAL	Other
bracing	Short-Term Composite

5.2. Static case load assignments

Table 15: Case - Static 1 - Load Assignments

Table 15: Case - Static 1 - Load Assignments

Case	LoadType	LoadName	LoadSF
DEAD	Load pattern	DEAD	1.
bracing	Load pattern	bracing	1.

5.3. Response spectrum case load assignments

Table 16: Function - Response Spectrum - User

Table 16: Function - Response Spectrum - User

Name	Period	Accel	FuncDamp
	Sec		
UNIFRS	0.	1.	0.05
UNIFRS	1.	1.	

6. Load combinations

This section provides load combination information.

Table 17: Combination Definitions

Table 17: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
COMB1	Linear Add	bracing	1.
DSTL1	Linear Add	DEAD	1.
DSTL2	Linear Add	DEAD	1.
DSTL2		bracing	1.
DSTL3	Linear Add	DEAD	1.
DSTL4	Linear Add	DEAD	1.
DSTL4		bracing	1.

7. Structure results

This section provides structure results, including items such as structural periods and base reactions.

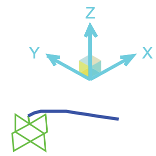


Figure 2: Deformed shape

7.1. Mass summary

Table 18: Assembled Joint Masses, Part 1 of 2

Table 18: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Kip-s2/in	Kip-s2/in	Kip-s2/in	Kip-in-s2	Kip-in-s2	Kip-in-s2	in
2	MSSSRC1	0.0089	0.0089	0.0089	0.	0.	0.	-96.
3	MSSSRC1	0.0089	0.0089	0.0089	0.	0.	0.	-30.
SumAccelUX	MSSSRC1	0.0178	0.	0.	0.	0.	0.	-63.
SumAccelUY	MSSSRC1	0.	0.0178	0.	0.	0.	0.	-63.
SumAccelUZ	MSSSRC1	0.	0.	0.0178	0.	0.	0.	-63.

Table 18: Assembled Joint Masses, Part 2 of 2

Table 18: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		in	in
2	MSSSRC1	0.	0.
3	MSSSRC1	0.	0.
SumAccelUX	MSSSRC1	0.	0.
SumAccelUY	MSSSRC1	0.	0.
SumAccelUZ	MSSSRC1	0.	0.

7.2. Modal results

Table 19: Modal Participating Mass Ratios

Table 19: Modal Participating Mass Ratios

OutputCase	StepNum	Period	UX	UY	UZ	SumUX	SumUY	SumUZ
		Sec						
MODAL	1.	0.013502	0.	1.	0.	0.	1.	0.
MODAL	2.	0.008906	0.	0.	1.	0.	1.	1.
MODAL	3.	0.002358	1.	0.	0.	1.	1.	1.

7.3. Base reactions

Table 20: Base Reactions

Table 20: Base Reactions

OutputCase	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
	Kip	Kip	Kip	Kip-in	Kip-in	Kip-in
DEAD	0.	0.	6.856	0.	431.915	0.
bracing	0.	0.	873.125	0.	55006.875	0.

8. Joint results

This section provides joint results, including items such as displacements and reactions.

Table 21: Joint Displacements

Table 21: Joint Displacements

Joint	OutputCase	U1	U2	U3	R1	R2	R3
		in	in	in	Radians	Radians	Radians
2	DEAD	0.	0.	0.	0.	0.	0.
2	bracing	0.	0.	0.	0.	0.	0.
3	DEAD	0.	0.	-0.000621	0.	9.394E-06	0.
3	bracing	0.	0.	-0.07904	0.	0.001196	0.

Table 22: Joint Reactions

Table 22: Joint Reactions

Joint	OutputCase	F1	F2	F3	M1	M2	M3
		Kip	Kip	Kip	Kip-in	Kip-in	Kip-in
2	DEAD	0.	0.	6.856	0.	-226.241	0.
2	bracing	0.	0.	873.125	0.	-28813.125	0.

9. Frame results

This section provides frame force results.

Table 23: Element Forces - Frames, Part 1 of 2

Table 23: Element Forces - Frames, Part 1 of 2

Frame	Station	OutputCase	P	V2	V3
	in		Kip	Kip	Kip
2	0.	DEAD	0.	-6.856	0.
2	22.	DEAD	0.	-4.571	0.
2	44.	DEAD	0.	-2.285	0.
2	66.	DEAD	0.	-5.551E-17	0.
2	0.	bracing	0.	-873.125	0.
2	22.	bracing	0.	-582.083	0.
2	44.	bracing	0.	-291.042	0.
2	66.	bracing	0.	-8.882E-14	0.

Table 23: Element Forces - Frames, Part 2 of 2

Table 23: Element Forces - Frames, Part 2 of 2

Frame	Station	OutputCase	T	M2	M3
	in		Kip-in	Kip-in	Kip-in
2	0.	DEAD	0.	0.	-226.241
2	22.	DEAD	0.	0.	-100.552
2	44.	DEAD	0.	0.	-25.138
2	66.	DEAD	0.	0.	2.265E-14
2	0.	bracing	0.	0.	-28813.125
2	22.	bracing	0.	0.	-12805.833
2	44.	bracing	0.	0.	-3201.458
2	66.	bracing	0.	0.	4.661E-12

10. Material take-off

This section provides a material take-off.

Table 24: Material List 2 - By Section Property

Table 24: Material List 2 - By Section Property

Section	ObjectType	NumPieces	TotalLength	TotalWeight
			in	Kip
W24x176	Frame	1	66.	6.856

11. Design preferences

This section provides the design preferences for each type of design, which typically include material reduction factors, framing type, stress ratio limit, deflection limits, and other code specific items.

11.1. Steel design

Table 25: Preferences - Steel Design - AISC 360-10, Part 1 of 4

Table 25: Preferences - Steel Design - AISC 360-10, Part 1 of 4

THDesign	FrameType	PatLLF	SRatioLimit	MaxIter	SDC	SeisCode	SeisLoad	ImpFactor
Envelopes	SMF	0.75	0.95	1	D	Yes	Yes	1.

Table 25: Preferences - Steel Design - AISC 360-10, Part 2 of 4

Table 25: Preferences - Steel Design - AISC 360-10, Part 2 of 4

SystemRho	SystemSds	SystemR	SystemCd	Omega0	Provision	AMethod	SOMethod	SRMethod
1.	0.5	8.	5.5	3.	ASD	Direct Analysis	General 2nd Order	Tau-b Fixed

Table 25: Preferences - Steel Design - AISC 360-10, Part 3 of 4

Table 25: Preferences - Steel Design - AISC 360-10, Part 3 of 4

NLCoeff	OmegaB	OmegaC	OmegaTY	OmegaTF	OmegaV	OmegaVRolledI	OmegaVT	PlugWeld
0.002	1.67	1.67	1.67	2.	1.67	1.5	1.67	Yes

Table 25: Preferences - Steel Design - AISC 360-10, Part 4 of 4

Table 25: Preferences - Steel Design - AISC 360-10, Part 4 of 4

HSSWelding	HSSReduceT	CheckDefl	DLRat	SDLAndLLRat	LLRat	TotalRat	NetRat
ERW	No	No	120.	120.	360.	240.	240.

11.2. Concrete design

Table 26: Preferences - Concrete Design - ACI 318-14, Part 1 of 2

Table 26: Preferences - Concrete Design - ACI 318-14, Part 1 of 2

THDesign	NumCurves	NumPoints	MinEccen	PatLLF	UFLimit	SeisCat	Rho	Sds
Envelopes	24	11	Yes	0.75	0.95	D	1.	0.5

Table 26: Preferences - Concrete Design - ACI 318-14, Part 2 of 2

Table 26: Preferences - Concrete Design - ACI 318-14, Part 2 of 2

PhiT	PhiCTied	PhiCSpiral	PhiV	PhiVSeismic	PhiVJoint
0.9	0.65	0.75	0.75	0.6	0.85

11.3. Aluminum design

Table 27: Preferences - Aluminum Design - AA-ASD 2000

Table 27: Preferences - Aluminum Design - AA-ASD 2000

FrameType	SRatioLimit	LatFact	UseLatFact
Moment Frame	1.	1.333333	No

11.4. Cold formed design

Table 28: Preferences - Cold Formed Design - AISI-ASD96

Table 28: Preferences - Cold Formed Design - AISI-ASD96

FrameType	SRatioLimit	OmegaBS	OmegaBUS	OmegaBLTB	OmegaVS	OmegaVNS	OmegaT	OmegaC
Braced Frame	1.	1.67	1.67	1.67	1.67	1.5	1.67	1.8

12. Design overwrites

This section provides the design overwrites for each type of design, which are assigned to individual members of the structure.

12.1. Steel design

Table 29: Overwrites - Steel Design - AISC 360-10, Part 1 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 1 of 7

Frame	DesignSect	FrameType	Fy Kip/in2	RLLF	AreaRatio	XLMajor
2	Program Determined	Program Determined	0.	0.	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 2 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 2 of 7

Frame	XLMinor	XLLTB	K1Major	K1Minor	K2Major	K2Minor	KLTB
2	0.	0.	0.	0.	0.	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 3 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 3 of 7

Frame	CmMajor	CmMinor	Cb	B1Major	B1Minor	B2Major	B2Minor
2	0.	0.	0.	0.	0.	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 4 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 4 of 7

Frame	HSSReduceT	HSSWelding	Omega0	Ry	Pnc Kip	Pnt Kip	Mn3 Kip-in
2	Program Determined	Program Determined	0.	0.	0.	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 5 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 5 of 7

Frame	Mn2	Vn2	Vn3	CheckDefl	DeflType	DLRat	SDLAndLLRat
	Kip-in	Kip	Kip				
2	0.	0.	0.	Program Determined	Program Determined	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 6 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 6 of 7

Frame	LLRat	TotalRat	NetRat	DLAbs	SDLAndLLAbs	LLAbs	TotalAbs
				in	in	in	in
2	0.	0.	0.	0.	0.	0.	0.

Table 29: Overwrites - Steel Design - AISC 360-10, Part 7 of 7

Table 29: Overwrites - Steel Design - AISC 360-10, Part 7 of 7

Frame	NetAbs	SpecCamber	DCLimit
	in	in	
2	0.	0.	0.

Sheet No. _______ of _______

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541
Made By: SK
Date : 12/13/2018
For : FIRST STREET TURNING BASIN
Checked By:
Date :

Subject: **Strut @ El. -20 _ seperated section**

Beam Steel

Design Method: ◉ ASD - 14th Ed. ○ LRFD - 14th Ed. ○ ASD - 9th Ed. ○ AASHTO

Add Self Weight: No

**** DATA INPUT **** (Enter unfactored loads for ASD and factored loads for LRFD and AASHTO)

Axial Force	P (kips):	1750.0
Bending Moment	Mx (kip-ft):	0.0
Bending Moment	My (kip-ft):	0.0
Shear (weak axis)	Vx (kips):	0.0
Shear (strong axis)	Vy (kips):	0.0
Unbraced Length	Lx (ft):	0.00
Unbraced Length	Ly (ft):	0.00
Unsupp.L.compr.flange	Lb (ft):	0.00
Length Factor	Kx:	1.00
Length Factor	Ky:	1.00
Mem Angle w/hor	Alpha (deg):	0.00
Web angle w/ ver	Beta (deg):	0.00
Steel Strength	Fy (ksi):	50.00

Bending Coefficient: Cb = 1.00

**** SECTION PROPERTIES ****

<<<<< MEMBER IS HP16x162 >>>>>

A (in^2) =	47.70	rts (in) =	4.45		
d (in) =	16.30	tw (in) =	1.00	Lp (ft) =	13.49
bf (in) =	16.10	tf (in) =	1.00	Lr (ft) =	60.28
Sx (in^3) =	269.00	Zx (in^3) =	306.00		
Sy (in^3) =	86.60	Zy (in^3) =	134.00		

Unbraced Length Criteria: Lp (ft) = 13.49, Lr (ft) = 60.28

**** ANALYSIS RESULTS ****

Computed Moment	Mx (kip-ft):	0.0	Computed Shear	Vx (kip):	0.0
Computed Moment	My (kip-ft):	0.0	Computed Shear	Vy (kip):	0.0
Computed Axial	fa (ksi):	36.69			
Computed Bending	fbx (ksi):	0.00	Computed Shear Stress	fvx (ksi):	0.00
Computed Bending	fby (ksi):	0.00	Computed Shear Stress	fvy (ksi):	0.00

Axial Capacity	Pc (kip):	1428.1	P/Pc =	1.23
Bending Capacity	Mcx (kip-ft):	763.5	Mx/Mcx =	0.00
Bending Capacity	Mcy (kip-ft):	334.3	My/Mcy =	0.00
Shear Capacity	Vcx (kip):	289.2	Vx/Vcx =	0.00
Shear Capacity	Vcy (kip):	326.0	Vy/Vcy =	0.00

**** COMBINED LOADING CHECK ****

For P/Pc >= 0.2:

P/Pc + 8/9 * (Mx/Mcx + My/Mcy) = 1.23

Since no reduction is considered for liquefaction case:
Combined loading check: 1.23/1.67 = 0.73 : OK

CONNECTIONS

REFER TO SOE-501 FOR TEMPORARY CONNECTION DETAILS AND S-201 FOR PERMANENT CONNECTION DETAILS.

Sheet No.__ of__

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK

Date: 11/13/2018

FOR: FIRST ST TURNING BASIN

Checked By: TC

Date: 11/14/2018

SUBJECT: WALE TO STRUT CONNECTION

BEARING R

For HP14x117 Strut, b.f = 14.9 inches

For HP16x121 Wale, b.f=15.9 inches

Maximum temporary brace reaction $R := 25.4\text{klf}$ See Sheet 5 (South Bulkhead Staging Summary)

Reaction from RISA $L := 16\dfrac{\text{kip}}{\text{klf}}$

Load $P := R \cdot L = 406.4 \cdot \text{kip}$

Bearing plate thickness calculation

$F_y := 36\text{ksi}$

Choose 16 inch x 16 inch plate

$B := 16\text{in}$ $N := 16\text{in}$

For HP14x117

Depth $d := 14.2\text{in}$

Critical Cantilever Length $L := \dfrac{1}{2} \cdot (B - d)$ $L = 0.9 \cdot \text{in}$

Max Moment $M_{max} := \dfrac{P}{N} \cdot \dfrac{L^2}{2}$ $M_{max} = 0.86 \cdot \text{kip} \cdot \text{ft}$

$\Omega_b := 1.67$

Required Thickness $t_{pl\_req} := \sqrt{\dfrac{4 \cdot M_{max} \cdot \Omega_b}{F_y \cdot N}}$ $t_{pl\_req} = 0.35 \cdot \text{in}$ **Use 0.5" thick plate**

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No.___ of ___
File: 12541
Made By: SK
Date: 11/13/2018
FOR: FIRST ST TURNING BASIN
Checked By: TC
Date: 11/14/18

SUBJECT: Stiffner Plate Check

CHECK CONCENTRATED FORCES AT STRUT LOCATIONS

Beam Properties: HP16X121

$d := 15.8in$ $t_w := 0.75in$ $t_f := 0.75in$ $F_y := 50ksi$

$k := 1.9375in$ $T := 11.75in$ $b_f := 15.9in$ $E := 29000ksi$

Length of bearing $N := 15in$ Laterally unbraced length of flange $l_b := 5.5ft$

Maximum temporary brace reaction $R := 25.4klf$ See Sheet 5 (South Bulkhead Staging Summary)

Reaction from RISA $L := 16\frac{kip}{klf}$

Load $P := R \cdot L = 406.40 \cdot kip$

Web Local Yielding J10-2 $\Omega_w := 1.50$ Note: concentrated force applied $\leq$ d/2 away from member end

Available Strength $R_{yield} := \frac{1}{\Omega_w} \cdot (2.5 \cdot k + N) \cdot F_y \cdot t_w$ $R_{yield} = 496 \cdot kip$

Note: force applied > d/2 away from member end

$$\frac{1}{\Omega_w} \cdot (5 \cdot k + N) \cdot F_y \cdot t_w = 617 \cdot kip$$

Web Crippling J10-4 $\Omega_w := 2.00$ Note: concentrated force applied < d/2 away from member end

Available Strength
$$R_{cripple} := \frac{1}{\Omega_w} \cdot 0.40 \cdot t_w^2 \cdot \sqrt{\frac{E \cdot F_y \cdot t_f}{t_w}} \cdot \text{if}\left[\frac{N}{d} \leq 0.2, \left[1 + 3 \cdot \left(\frac{N}{d}\right) \cdot \left(\frac{t_w}{t_f}\right)^{1.5}\right], \left[1 + \left(\frac{4 \cdot N}{d} - 0.2\right) \cdot \left(\frac{t_w}{t_f}\right)^{1.5}\right]\right]$$

$R_{cripple} = 623 \cdot kip$

Note: force applied $\geq$ d/2 away from member end

$$\frac{1}{\Omega_w} \cdot 0.80 \cdot t_w^2 \cdot \left[1 + 3 \cdot \frac{N}{d} \cdot \left(\frac{t_w}{t_f}\right)^{1.5}\right] \cdot \sqrt{\frac{E \cdot F_y \cdot t_f}{t_w}} = 1043 \cdot kip$$

Sidesway buckling $\frac{\frac{d}{t_w}}{\left(\frac{N}{b_f}\right)} = 22.33 > 1.7$ Limit of sidesway buckling doesnt apply!

Controlling Available Strength $R_n := \min(R_{yield}, R_{cripple})$ $R_n = 496 \cdot kip$

$Stiff\_Check := \text{if}(P \leq R_n, \text{"OK"}, \text{"NG"})$

$Stiff\_Check = \text{"OK"}$ → Stiffeners not req'd

PUT 1/2" STIFF. PL AT WALES

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541
Made By: SK Date: 11/12/2018
FOR: FIRST ST TURNING BASIN Checked By: Date:

SUBJECT: Wale Bracket Design

Wale bracket is welded to 20" and 34" dia. pipe piles. Weld is desgined to resist self weight of wale and connections.

Pipe pile is circular; weld only along vertical edges for constructability purposes.

W member is welded on both sides of pipe pile

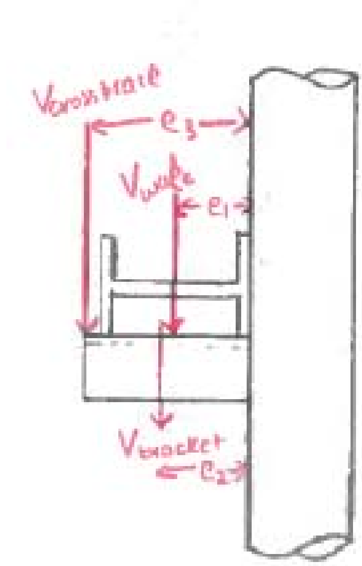
Forces

Heaviest member wale is HP16x121

$w_{wale1} := 121\text{plf}$

Consider maximum span between two brackets as 15 ft

Choose self weight of connections and live load as 120 plf and 100 plf live load



$w_{con} := 220\text{plf}$

$w_{total} := w_{wale1} + w_{con} = 341 \cdot \text{plf}$

Strut is HP14x117

$L_{brace} := 32\text{ft}$

$w_{cb} := 117\text{plf}$

Choose WT8x15.5 with b.f=5.53 inches

$d := 7.94\text{in}$ $\quad t_w := 0.275\text{in}$

$t_f := 0.44\text{in}$ $\quad S_{xx} := 4.64\text{in}^3$

$k := 0.842\text{in}$

$w_{sw} := 15.5\text{plf}$

Span

$L := 15\text{ft}$

Maximum shear is

$$V_{wale} := \frac{w_{total} \cdot L}{2} = 2.56 \cdot \text{kip}$$

$$V_{bracket} := w_{sw} \cdot 1.5\text{ft} = 0.02 \cdot \text{kip}$$

$$V_{cross} := \frac{w_{cb} \cdot L_{brace}}{2} = 1.87 \cdot \text{kip}$$

Choose a 1.5 ft long bracket for HP16 member.

Assuming this force acts at center of wale. Weld is at sheet pile. Choose eccentricity from center of wale to weld

$e_1 := 7.95in$

$M_{wale} := V_{wale} \cdot e_1 = 20.33 \cdot kip \cdot in$

$e_2 := \dfrac{1.5ft}{2}$

$M_{bracket} := V_{bracket} \cdot e_2 = 0.21 \cdot kip \cdot in$

$e_3 := 1.5ft$

$M_{cb} := V_{cross} \cdot e_3 = 2.81 \cdot kip \cdot ft$

$V := V_{wale} + V_{bracket} + V_{cross} = 4.45 \cdot kip$

$M := M_{bracket} + M_{wale} + M_{cb} = 54.24 \cdot kip \cdot in$

Stresses in Bracket

Bending stress $f_b := \dfrac{M}{S_{xx}}$ $f_b = 11.69 \cdot ksi$ < $F_b := 30ksi$ OK

Shear stress $f_v := \dfrac{V}{d \cdot t_w}$ $f_v = 2.04 \cdot ksi$ < $F_v := 20ksi$ OK

Length of weld

$d_{weld} := d - k = 7.1 \cdot in$

Refer to AISC 15th Edition

Choose 5/16 inch weld , Equation 8-2b

$R_{all} := 0.928 \dfrac{kip}{in} \cdot 5 = 4.64 \cdot \dfrac{kip}{in}$

For bending

$S_x := \dfrac{d_{weld}^{\ 2}}{3} = 16.79 \cdot in^2$

Total length of weld

$L_w := 2 \cdot d_{weld} = 14.2 \cdot in$

$R := \sqrt{\left(\dfrac{V}{L_w}\right)^2 + \left(\dfrac{M}{S_x}\right)^2} = 3.24 \cdot \dfrac{kip}{in}$ < $R_{all} = 4.64 \cdot \dfrac{kip}{in}$

Sheet No.__ of__

MUESER RUTLEDGE CONSULTING ENGINEERS File: 12541

Made By: SK Date: 11/13/2018

FOR: FIRST ST TURNING BASIN Checked By:___ Date:___

SUBJECT: WALE TO STRUT CONNECTION

For HP14x117 Strut, b.f = 14.9 inches For HP16x121 Wale, b.f=15.9 inches

Choose 5/16 inch weld , Equation 8-2b

$$R_{all} := 0.928\frac{kip}{in}\cdot 5 = 4.64\cdot\frac{kip}{in}$$

For HP14 member

$d_w := 14.2in$ $\qquad$ $b_f := 14.9in$

$k_1 := 1.625in$ $\qquad$ $k := 2.0625in$

$d := d_w - k_1 = 12.57\cdot in$ $\qquad$ $b := b_f - k = 12.84\cdot in$

$L := d + 2\cdot b = 38.25\cdot in$ $\qquad$ Length of weld

$$S_x := \frac{2b_f\cdot d + d^2}{3} = 177.62\cdot in^2$$ Section modulus of weld

Strut is HP14x117 $\qquad$ $L_{brace} := 32ft$ $\qquad$ $w_s := 117plf$

Reaction from strut weight at end:
(half of total strut weight) $\qquad$ $V_{Strut} := \frac{L_{brace}}{2}\cdot w_s = 1.87\cdot kip$

Weight of connection materials at end $\qquad$ $V_{CM} := 0.6\cdot V_{Strut}$ $\qquad$ $V_{CM} = 1.12\cdot kip$

Total shear $\qquad$ $V := (V_{Strut} + V_{CM})$ $\qquad$ $V = 3\cdot kip$

Total eccentricity to design weld $\qquad$ $e := \frac{L_{brace}}{4} + 6in = 102\cdot in$

Total Moment $\qquad$ $M := V\cdot e = 25.46\cdot kip\cdot ft$

$$R := \sqrt{\left(\frac{V}{L}\right)^2 + \left(\frac{M}{S_x}\right)^2} = 1.72\cdot\frac{kip}{in} \quad < \quad R_{all} = 4.64\cdot\frac{kip}{in}$$

For End plate to wale weld $\qquad$ $b_{fp} := 15.9in$

$L := 2\cdot b_{fp} = 31.8\cdot in$ $\qquad$ Length of weld

$$S_x := \frac{b_{fp}^{\,2}}{3} = 84.27\cdot in^2$$ Section modulus of weld

$$R := \sqrt{\left(\frac{V}{L}\right)^2 + \left(\frac{M}{S_x}\right)^2} = 3.63\cdot\frac{kip}{in} \quad < \quad R_{all} = 4.64\cdot\frac{kip}{in}$$

Sheet No.__ of__
File: 12541

MUESER RUTLEDGE CONSULTING ENGINEERS

Made By: SK
Date: 11/13/2018

FOR: FIRST ST TURNING BASIN
Checked By: TV
Date: 11/14/18

SUBJECT: WALE TO STRUT CONNECTION

End plate thickness calculation

Plate is square: 16x16

$F_y := 36ksi$

Choose thickness of plate as 1 inch

$t_{pl} := 1in$

$B := 16in$

$D := 16in$

Maximum temporary brace reaction $R := 25.4klf$ See Sheet 5 (South Bulkhead Staging Summary)

Reaction from RISA $L := 16\frac{kip}{klf}$

Load $P := R \cdot L = 406.4 \cdot kip$

Thickness of flange for HP14 $t_f := 0.8in$

Flange width $b_f := 14.9in$

For 1:1 bearing projections for shim plates taken at mid-section of plate

$b_{projected} := t_{pl} + t_f = 1.8\,in$

$d_{projected} := t_{pl} + b_f = 15.9\,in$

Hence shim plates shall be atleast 3" wide by 16 inches long

Area

$A := b_{projected} \cdot d_{projected} = 28.62\,in^2$

Per flange taked half the load $P_l := \frac{P}{2} = 203.2\,kip$

Stress $\sigma := \frac{P_l}{A} = 7.1\,ksi$

$F_y := 36ksi$

Allowable stress $F_{al} := 0.6 \cdot F_y = 21.6\,ksi$

MUESER RUTLEDGE CONSULTING ENGINEERS

Sheet No.__ of__
File: 12541
Made By: SK
Date: 11/13/2018
FOR: FIRST ST TURNING BASIN
Checked By: TC
Date: 11/14/18

SUBJECT: WALE TO STRUT CONNECTION

End plate thickness calculation

Plate is square: 16x16

Choose thickness of plate as 1 inch

$t_{pl} := 1\text{in}$

$B := 16\text{in}$

$N := 16\text{in}$

Maximum temporary brace reaction $R := 25.4\text{klf}$ See Sheet 5 (South Bulkhead Staging Summary)

Reaction from RISA $L := 16\dfrac{\text{kip}}{\text{klf}}$

$P := R \cdot L = 406.4 \cdot \text{kip}$

Thickness of flange for HP14 $t_f := 0.8\text{in}$

Flange width $b_f := 14.9\text{in}$

Depth of HP14 (AISC 14-10 Page)

$m := \dfrac{N - 0.95 \cdot d_w}{2} = 1.26\text{ in}$ $\quad n := \dfrac{B - 0.8 \cdot b_f}{2} = 2.04\text{ in}$

$P_p := F_{al} \cdot B \cdot N = 5529.6\text{ kip}$

$$X := \left[\frac{4 \cdot d_w \cdot b_f}{\left(d_w + b_f\right)^2}\right] \frac{P}{P_p} = 0.07$$

$$\lambda := \frac{2 \cdot \sqrt{X}}{\left(1 + \sqrt{1 - X}\right)} = 0.28$$

$$n_l := \frac{\sqrt{b_f \cdot d_w}}{4} = 3.64\text{ in}$$

$$L_{pl} := \max\left(m, n, \lambda \cdot n_l\right) = 2.04\text{ in}$$

$$t := L_{pl} \cdot \sqrt{\frac{1.67 \cdot 2 \cdot P}{F_y \cdot B \cdot N}} = 0.78\text{ in}$$

Choose thickness of plae as 1 inch

CHECK CONCENTRATED FORCES AT STRUT LOCATIONS

(AISC 15TH EDITION)

Beam Properties:
W24x176

$d := 25.2\text{in}$ $t_w := 0.75\text{in}$ $t_f := 1.34\text{in}$ $F_y := 50\text{ksi}$

$k := 1.84\text{in}$ $T := 20\text{in}$ $b_f := 12.9\text{in}$ $E := 29000\text{ksi}$

Length of bearing $N := 12.9\text{in}$

Concentrated Force $P := 1750\text{kip}$ (Loads from strut) See Sheet 151 (Bracing Summary - Permanent Condition)

Web Local Yielding
J10-2

$\Omega_w := 1.50$ Note: concentrated force applied $\leq$ d/2 away from member end

Available Strength $R_{yield} := \frac{1}{\Omega_w}\cdot(2.5\cdot k + N)\cdot F_y\cdot t_w$ $R_{yield} = 438\cdot\text{kip}$

Note: force applied > d/2 away from member end

$$\frac{1}{\Omega_w}\cdot(5\cdot k + N)\cdot F_y\cdot t_w = 552\cdot\text{kip}$$

Web Crippling
J10-4

$\Omega_w := 2.00$ Note: concentrated force applied < d/2 away from member end

Available Strength

$$R_{cripple} := \frac{1}{\Omega_w}\cdot 0.40\cdot t_w^{2}\cdot\sqrt{\frac{E\cdot F_y\cdot t_f}{t_w}}\cdot \text{if}\left[\frac{N}{d}\leq 0.2,\left[1+3\cdot\left(\frac{N}{d}\right)\cdot\left(\frac{t_w}{t_f}\right)^{1.5}\right],\left[1+\left(\frac{4\cdot N}{d}-0.2\right)\cdot\left(\frac{t_w}{t_f}\right)^{1.5}\right]\right]$$

$R_{cripple} = 321\cdot\text{kip}$

Note: force applied $\geq$ d/2 away from member end

$$\frac{1}{\Omega_w}\cdot 0.80\cdot t_w^{2}\cdot\left[1+3\cdot\frac{N}{d}\cdot\left(\frac{t_w}{t_f}\right)^{1.5}\right]\cdot\sqrt{\frac{E\cdot F_y\cdot t_f}{t_w}} = 595\cdot\text{kip}$$

Controlling Available Strength $R_n := \min(R_{yield}, R_{cripple})$ $R_n = 321\cdot\text{kip}$

$\text{Stiff\_Check} := \text{if}(P \leq R_n, \text{"OK"}, \text{"NG"})$

$\text{Stiff\_Check} = \text{"NG"}$ $\rightarrow$ Stiffeners req'd

Design of stiffener plates: per AISC ASD - Section K1.8

- Stiffener plate properties:

Thickness of stiffener plate: $t_p := 0.75 \cdot in$

Effective area of section: $A := (t_w)\cdot(25\cdot t_w) + (t_p)\cdot(d - t_w)$ $A = 32.40\cdot in^2$

- Moment of inertia of section about the x-axis:

$$I_x := \frac{1}{12}\cdot(25\cdot t_w)\cdot(t_w)^3 + \frac{1}{12}\cdot(t_p)\cdot(d^3 - t_w{}^3) \qquad I_x = 1000.82\cdot in^4$$

- Radius of gyration about the x-axis: $r_x := \sqrt{\frac{I_x}{A}}$ $r_x = 5.56\cdot in$

- Determine slenderness ratio: $K := 1.0$ $L := d - 2\cdot(t_f)$

$$C_s := 0.75\cdot\left(\frac{K\cdot L}{r_x}\right) \qquad C_s = 3.0$$

- Calculate allowable stress: AISC ASD 9th Edition - Section E2 $E := 29000 ksi$

Check: $C_c := \sqrt{\frac{2\pi^2\cdot E}{F_y}}$ $C_c = 107$ > $C_s = 3.04$

Allowable stress:

$$F_a := \frac{\left(1 - \frac{C_s{}^2}{2\cdot C_c{}^2}\right)\cdot F_y}{\frac{5}{3} + \frac{3\cdot C_s}{8\cdot C_c} + \frac{C_s{}^3}{8\cdot C_c{}^3}} \qquad F_a = 29.80\cdot ksi$$

Allowable axial load: $F_a\cdot A = 965.44\cdot kip$> P/2=875 kip OK

Therefore, PROVIDE 0.75" STIFFENER PLATES, B.S. of W24x176 web

Sheet No.__ of__

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12541

Made By: SK Date: 11/13/2018

FOR: FIRST ST TURNING BASIN Checked By:____ Date:____

SUBJECT: WALE TO STRUT CONNECTION

For HP16x162 Strut, b.f = 16 inches For W24x176 Wale, b.f=12.9 inches

Choose 5/16 inch weld , Equation 8-2b

$$R_{all} := 0.928\frac{kip}{in}\cdot 5 = 4.64\cdot\frac{kip}{in}$$

For HP16 member

$d_w := 16in$ $\quad b_f := 16in$

$k_1 := 2in$ $\quad k := 2in$

$d := d_w - k_1 = 14\cdot in$ $\quad b := b_f - k = 14\cdot in$

$L := b = 14\cdot in$ Length of weld

$S_x := \frac{b^2}{3} = 65.33\cdot in^2$ Section modulus of weld

Strut is HP16x162 $\quad L_{brace} := 32ft$ $\quad w_s := 162plf$

Reaction from strut weight at end:
(half of total strut weight) $\quad V_{Strut} := \frac{L_{brace}}{2}\cdot w_s = 2.59\cdot kip$

Weight of connection materials at end $\quad V_{CM} := 0.6\cdot V_{Strut}$ $\quad V_{CM} = 1.56\cdot kip$

Total shear $\quad V := (V_{Strut} + V_{CM})$ $\quad V = 4.15\cdot kip$

No eccentricity as whole section encased in concrete

$R := \frac{V}{L} = 0.3\frac{kip}{in}$ $\quad <$ $\quad R_{all} = 4.64\cdot\frac{kip}{in}$

For End plate to wale weld $\quad b_{fp} := 12.9in$

$L := 2\cdot b_{fp} = 25.8\cdot in$ Length of weld

$S_x := \frac{b_{fp}^2}{3} = 55.47\cdot in^2$ Section modulus of weld

$R := \frac{V}{L} = 0.16\cdot\frac{kip}{in}$ $\quad <$ $\quad R_{all} = 4.64\cdot\frac{kip}{in}$

For HP16x162 Strut, b.f = 16 inches

For W24 Wale, b.f=12.9 inches

Load $P := 1750kip$ See Sheet 151 (Bracing Summary - Permanent Condition)

Bearing plate thickness calculation

$F_y := 36ksi$

Choose 18 inch x 18 inch plate

$B := 18in$ $N := 18in$

For HP16x162

Depth $d := 16in$

Critical Cantilever Length $L := \frac{1}{2} \cdot (B - d)$ $L = 1 \cdot in$

Max Moment $M_{max} := \frac{P}{N} \cdot \frac{L^2}{2}$ $M_{max} = 4.05 \cdot kip \cdot ft$

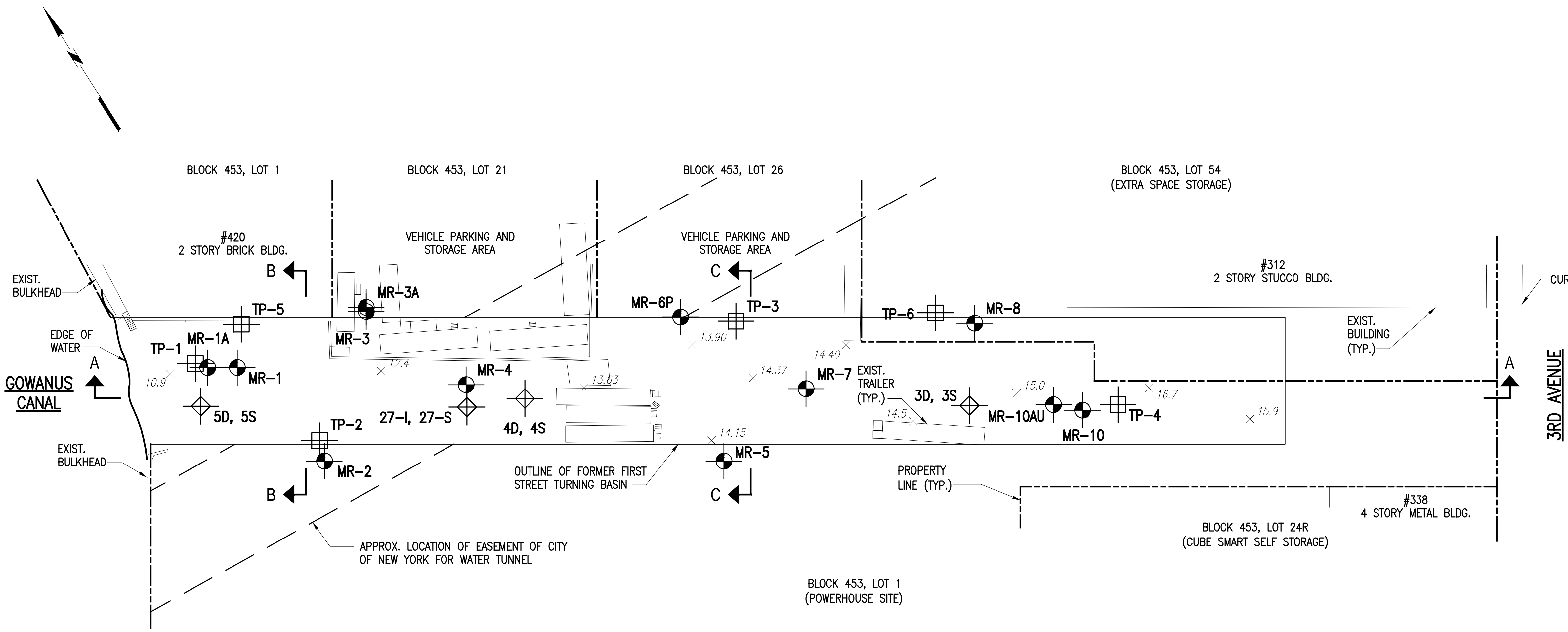
$\Omega_b := 1.67$

Required Thickness $t_{pl\_req} := \sqrt{\frac{4 \cdot M_{max} \cdot \Omega_b}{F_y \cdot N}}$ $t_{pl\_req} = 0.71 \cdot in$ **Use 0.75" thick plate**

APPENDIX

GEOLOGIC SECTIONS

Excerpt from the Subsurface Investigation Report by MRCE dated November 15, 2017



PLAN

30' 20' 10' 0 30' 60'

NOTES:

1. BASE DRAWING TAKEN FROM SURVEY DRAWING BY B.THAYER ASSOCIATES DATED OCTOBER 10, 2017.
2. ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. BORINGS MR-1 TO MR-8 AND MR-10 AND TEST PITS TP-1 TO TP-6 WERE MADE BY ASSOCIATED ENVIRONMENTAL SERVICES LTD. BETWEEN AUGUST 14, 2017 AND SEPTEMBER 22, 2017 UNDER THE CONTINUOUS INSPECTION OF MRCE. BORING MR-9 WAS REMOVED FROM THIS INVESTIGATION DUE TO ACCESS ISSUES.
4. AS DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS FOR BORINGS MR-1 TO MR-8 AND MR-10 AND TEST PITS TP-1 TO TP-6 WERE SURVEYED BY B.THAYER ASSOCIATES ON SEPTEMBER 18, 2017 AND COMPLETED ON OCTOBER 4, 2017.
5. BORINGS MR-2 AND MR-5 WERE MEASURED OFF LOCATIONS OF EXISTING FEATURES. APPROXIMATE GROUND SURFACE ELEVATIONS WERE PROVIDED BY ROUX ASSOCIATES.
6. FOR GEOLOGIC SECTIONS A-A, B-B, AND C-C, SEE DRAWINGS GS-1 TO GS-3.
7. STRATIFICATIONS SHOWN ON THE GEOLOGIC SECTIONS ARE BASED ON NECESSARY INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
8. SEE DRAWING NO. GS-R FOR BORING LEGEND AND SOIL CLASSIFICATION TERMINOLOGY.

LEGEND:

MR-6P
- MRCE BORING DRILLED IN 2017
- "P" INDICATES PIEZOMETER
- "A" INDICATES OFFSET
- "U" INDICATES UNDISTURBED SAMPLES

TP1
- MRCE TEST PIT PERFORMED IN 2017

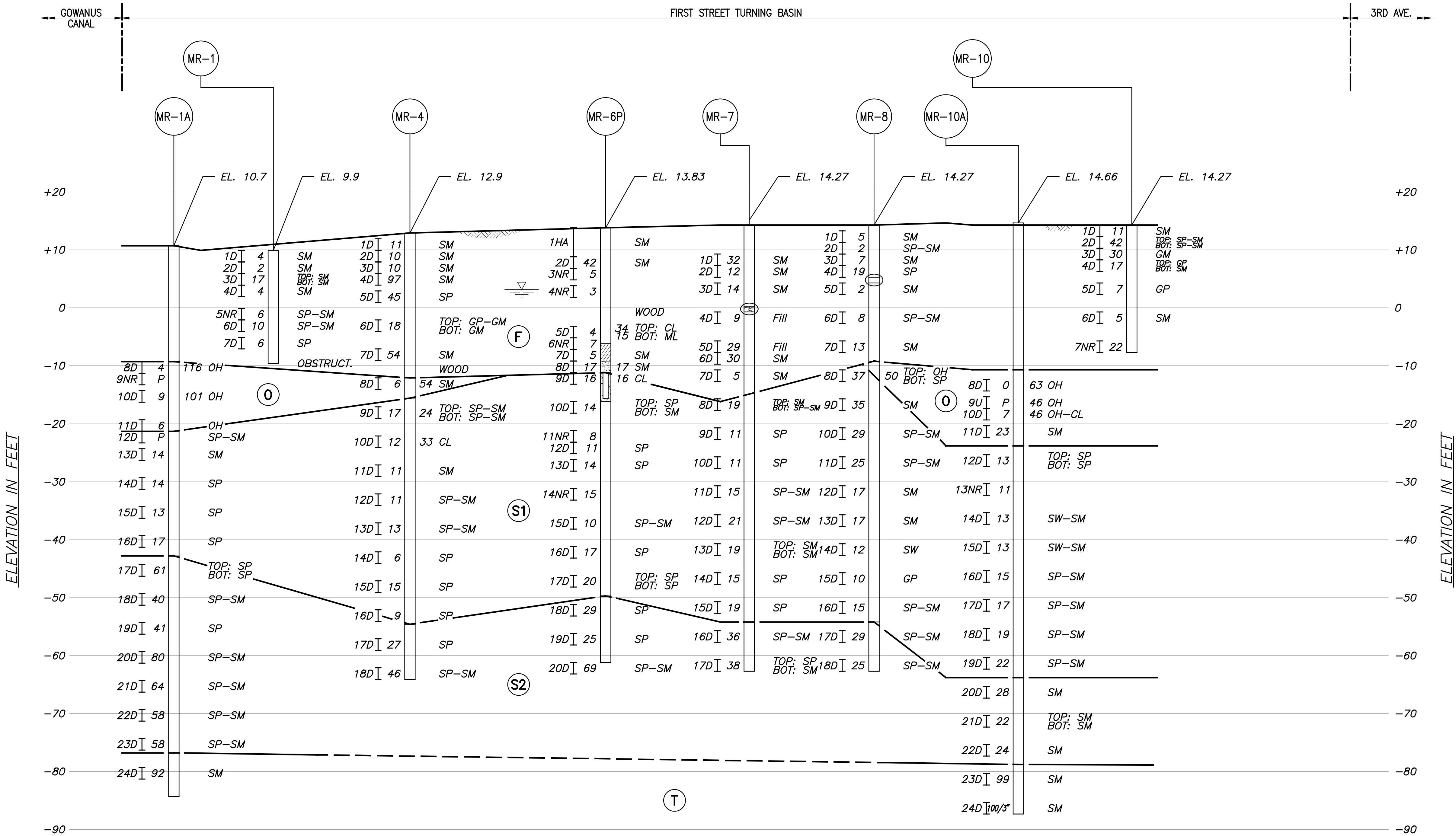
3S, 3D
- MONITORING WELL CLUSTER INSTALLED BY OTHERS (SEE APPENDIX E)
- "S" SHALLOW MONITORING WELLS SET IN THE FILL STRATUM
- "D" DEEP MONITORING WELLS SET IN THE UPPER SAND STRATUM

10.9
- GROUND SURFACE SPOT ELEVATION

FIRST STREET TURNING BASIN BROOKLYN — NEW YORK	
AKRF – KSE JOINT VENTURE NEW YORK — NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS 14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122	
SCALE: GRAPHIC; MADE BY: H.Y. DATE: 11-03-2017; CH'KD BY: A.E. DATE: 11-14-2017	FILE NUMBER 12541
BORING AND TEST PIT LOCATION PLAN	DRAWING NUMBER B-1

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING NO. B-1.



SECTION A-A

GENERAL STRATA DESCRIPTIONS:

(F) **FILL** – LOOSE TO COMPACT BROWN TO BLACK FINE TO COARSE SAND, SOME TO TRACE SILT, GRAVEL, BRICK, CONCRETE, WOOD, METAL, BOULDERS AND VARIOUS OBSTRUCTIONS

(O) **ORGANIC SILTY CLAY** – SOFT BLACK ORGANIC SILTY CLAY, SOME TO TRACE PEAT, FINE TO COARSE SAND, AND WOOD

(S1) **LOWER SAND (S1)** – LOOSE TO MEDIUM COMPACT BROWN TO RED FINE TO COARSE SAND, SOME TO TRACE SILT AND GRAVEL

(S2) **UPPER SAND (S2)** – MEDIUM COMPACT TO VERY COMPACT BROWN TO GRAY FINE TO COARSE SAND, TRACE TO SOME GRAVEL AND SILT

(T) **TILL** – VERY COMPACT BROWN COARSE TO FINE SAND, SOME SILT AND GRAVEL, TRACE MICA

GRAPHIC SCALE

HORIZONTAL: 30' 20' 10' 0 30' 60'

VERTICAL: 10' 5' 0 10' 20'

FIRST STREET TURNING BASIN	
BROOKLYN	NEW YORK
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NEW YORK	NEW YORK
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SCALE: GRAPHIC	MADE BY: H.Y. DATE: 11-03-2017
	CH'KD BY: A.E. DATE: 11-14-2017
FILE NUMBER: 12541	
GEOLOGIC SECTION A-A	DRAWING NUMBER: GS-1

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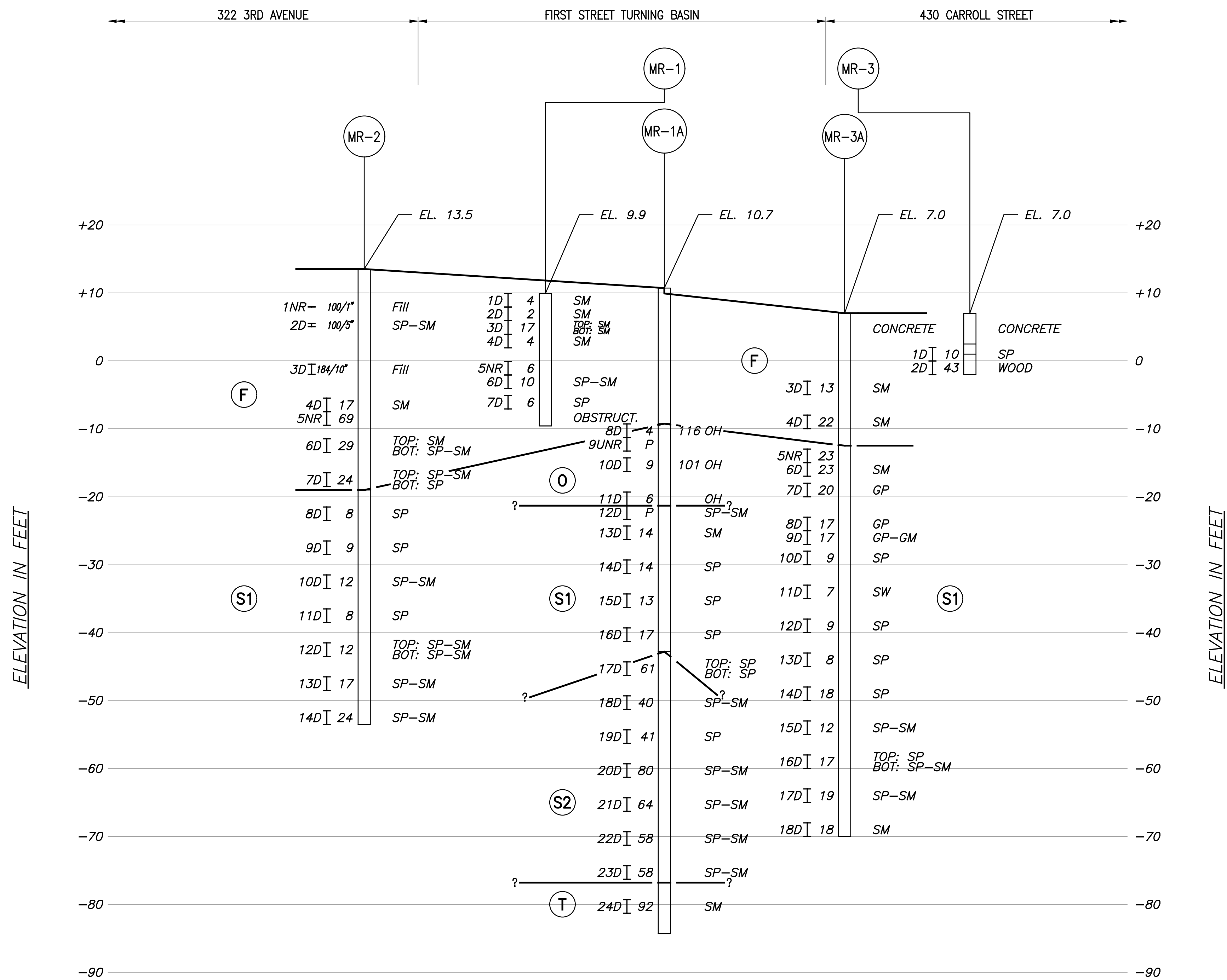
NOTES:
1. FOR GENERAL NOTES, SEE DRAWING NO. B-1.



SECTION B-B

GENERAL STRATA DESCRIPTIONS:

(F) **FILL** – LOOSE TO COMPACT BROWN TO BLACK FINE TO COARSE SAND, SOME TO TRACE SILT, GRAVEL, BRICK, CONCRETE, WOOD, METAL, BOULDERS AND VARIOUS OBSTRUCTIONS

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(S2) **UPPER SAND (S2)** – MEDIUM COMPACT TO VERY COMPACT BROWN TO GRAY FINE TO COARSE SAND, TRACE TO SOME GRAVEL AND SILT

(T) **TILL** – VERY COMPACT BROWN COARSE TO FINE SAND, SOME SILT AND GRAVEL, TRACE MICA

GRAPHIC SCALE
HORIZONTAL: 30' 20' 10' 0 30' 60'
VERTICAL: 10' 5' 0 10' 20'

FIRST STREET TURNING BASIN
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NEW YORK NEW YORK

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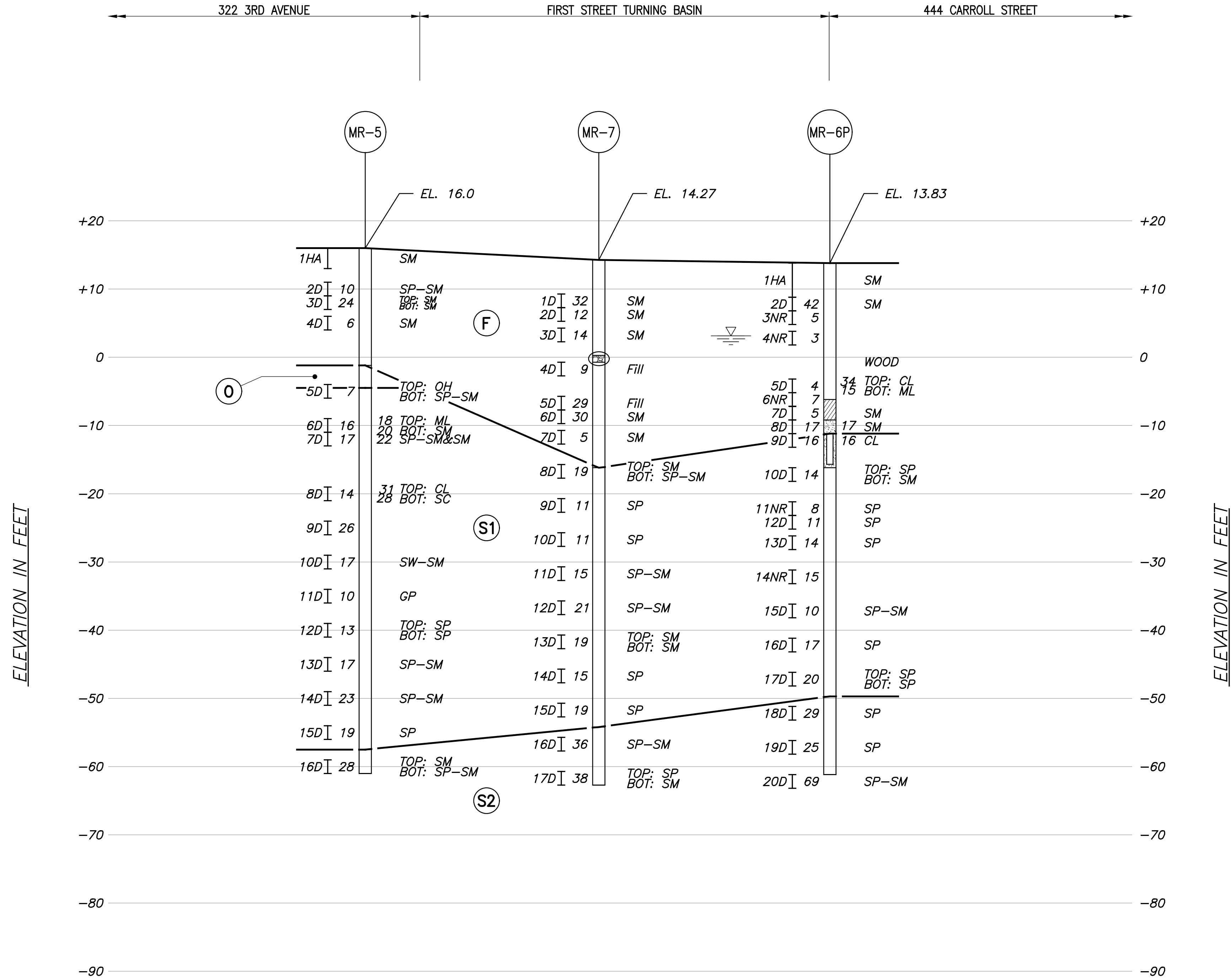
GRAPHIC	CH'KD BY: A.E.	DATE: 11-14-2017	12541

GEOLOGIC SECTION B-B
DRAWING NUMBER GS-2

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING NO. B-1.



SECTION C-C

GENERAL STRATA DESCRIPTIONS:

(F) **FILL** – LOOSE TO COMPACT BROWN TO BLACK FINE TO COARSE SAND, SOME TO TRACE SILT, GRAVEL, BRICK, CONCRETE, WOOD, METAL, BOULDERS AND VARIOUS OBSTRUCTIONS

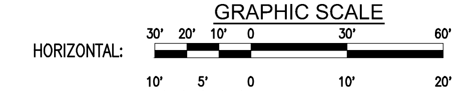
(O) **ORGANIC SILTY CLAY** – SOFT BLACK ORGANIC SILTY CLAY, SOME TO TRACE PEAT, FINE TO COARSE SAND, AND WOOD

(S1) **LOWER SAND (S1)** – LOOSE TO MEDIUM COMPACT BROWN TO RED FINE TO COARSE SAND, SOME TO TRACE SILT AND GRAVEL

(S2) **UPPER SAND (S2)** – MEDIUM COMPACT TO VERY COMPACT BROWN TO GRAY FINE TO COARSE SAND, TRACE TO SOME GRAVEL AND SILT

(T) **TILL** – VERY COMPACT BROWN COARSE TO FINE SAND, SOME SILT AND GRAVEL, TRACE MICA

GRAPHIC SCALE



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GRAPHIC	CH'KD BY: A.E.	DATE: 11-14-2017	12541

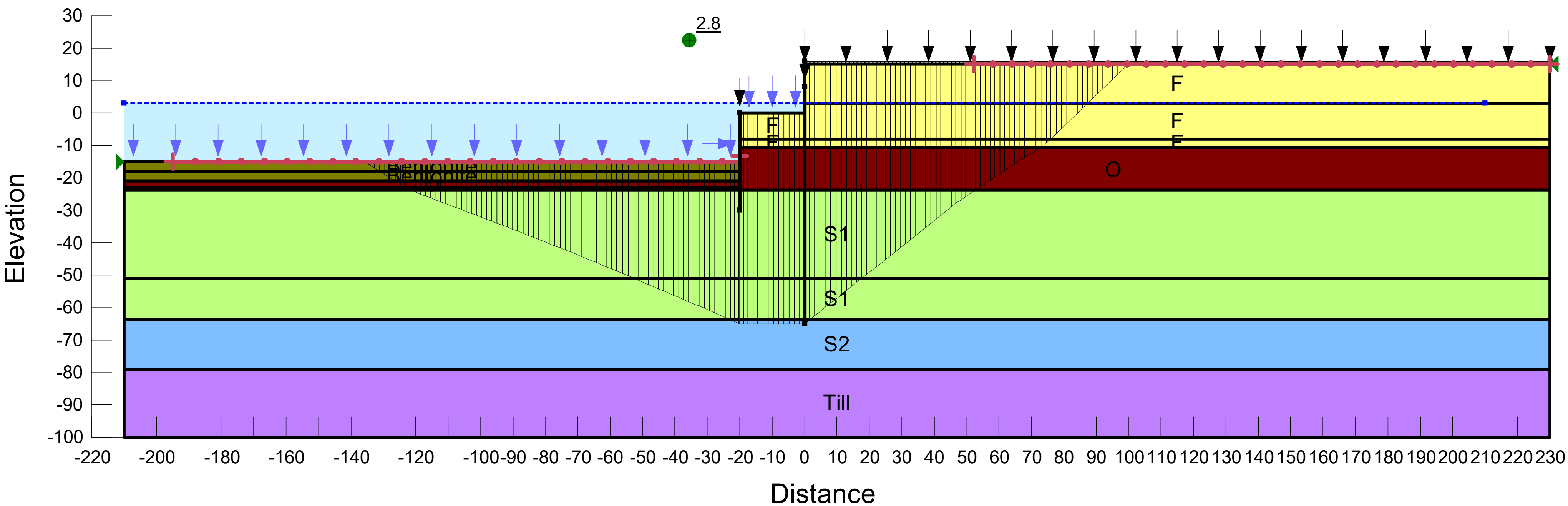
GEOLOGIC SECTION C-C

DRAWING NUMBER GS-3

SLOPE STABILITY ANALYSIS

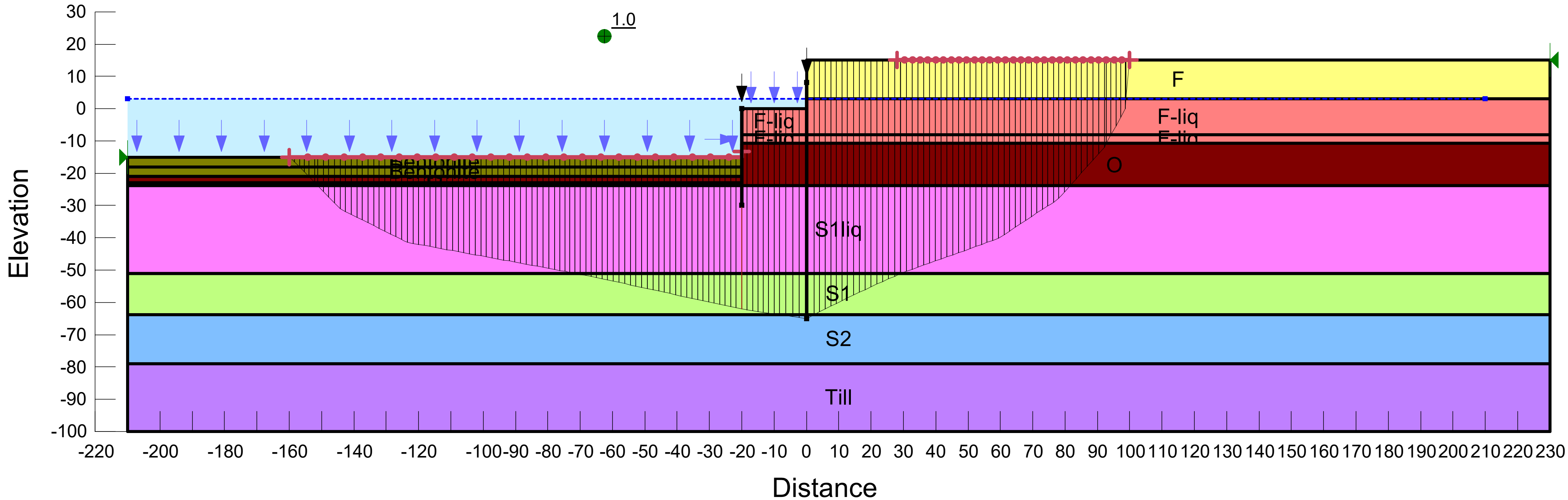
Section A-A Case 2: East-West Service

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



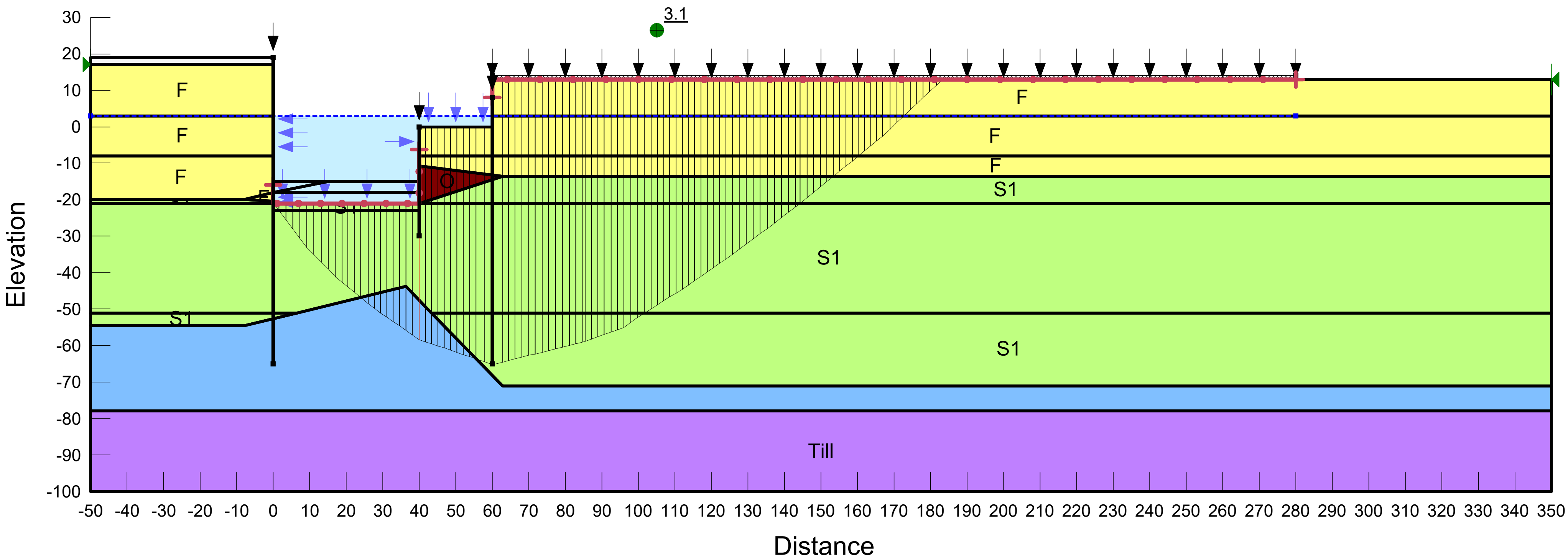
Section A-A Case 3: East-West Seismic

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: F-liq Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 80 psf C-Rate of Change: 1.82 psf/ft Limiting C: 100 psf
Name: S1liq Model: Undrained (Phi=0) Unit Weight: 120 pcf Cohesion: 230 psf
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



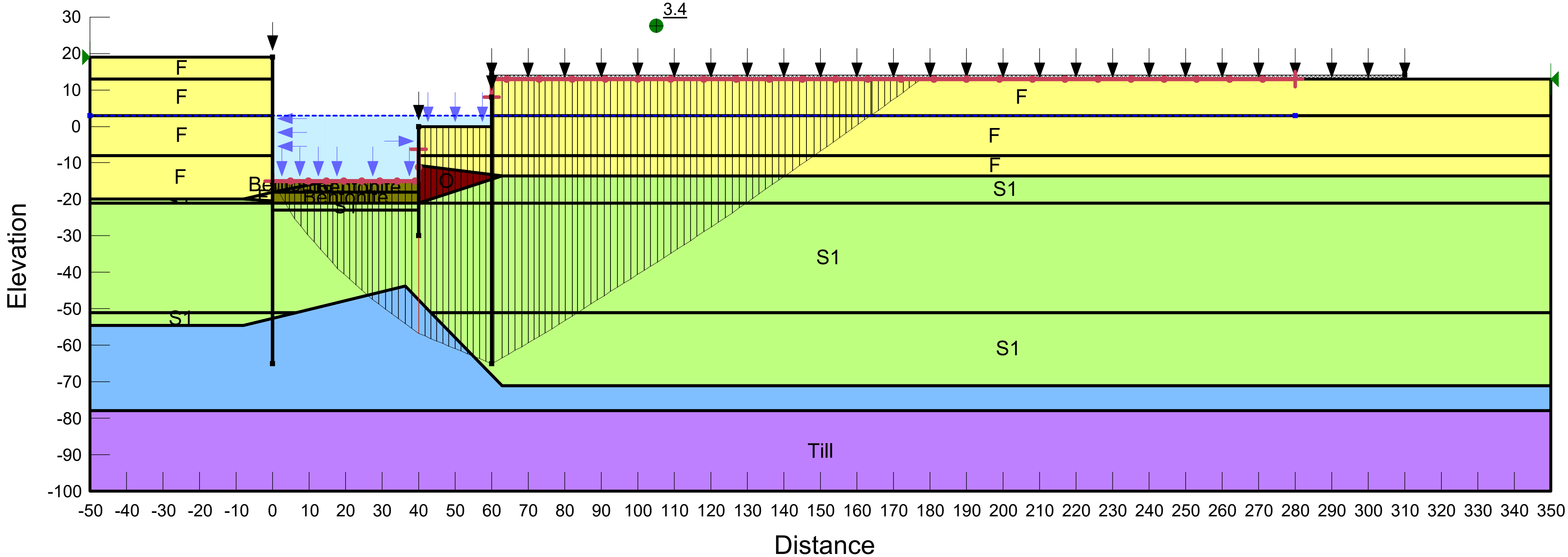
Section B-B Case 1: North-South Temporary Construction

Name: F	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion: 0 psf	Phi: 30 °
Name: S1	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion: 0 psf	Phi: 32 °
Name: S2	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion: 0 psf	Phi: 34 °
Name: Till	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion: 0 psf	Phi: 36 °
Name: O	Model: Undrained (Phi=0)	Unit Weight: 90 pcf	Cohesion: 400 psf	



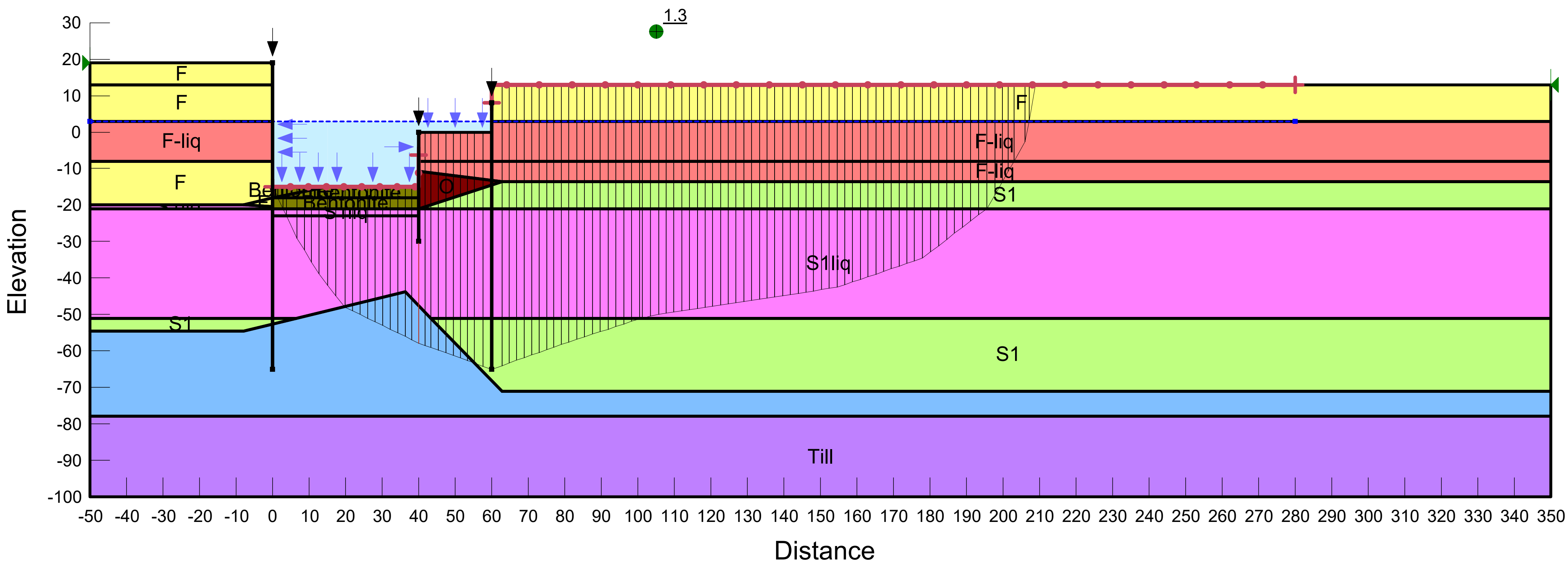
Section B-B Case 2: North-South Service

Name: F	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion: 0 psf	Phi: 30 °
Name: S1	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion: 0 psf	Phi: 32 °
Name: S2	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion: 0 psf	Phi: 34 °
Name: Till	Model: Mohr-Coulomb	Unit Weight: 130 pcf	Cohesion: 0 psf	Phi: 36 °
Name: O	Model: Undrained (Phi=0)	Unit Weight: 90 pcf	Cohesion: 400 psf	
Name: Bentonite	Model: Undrained (Phi=0)	Unit Weight: 90 pcf	Cohesion: 400 psf	



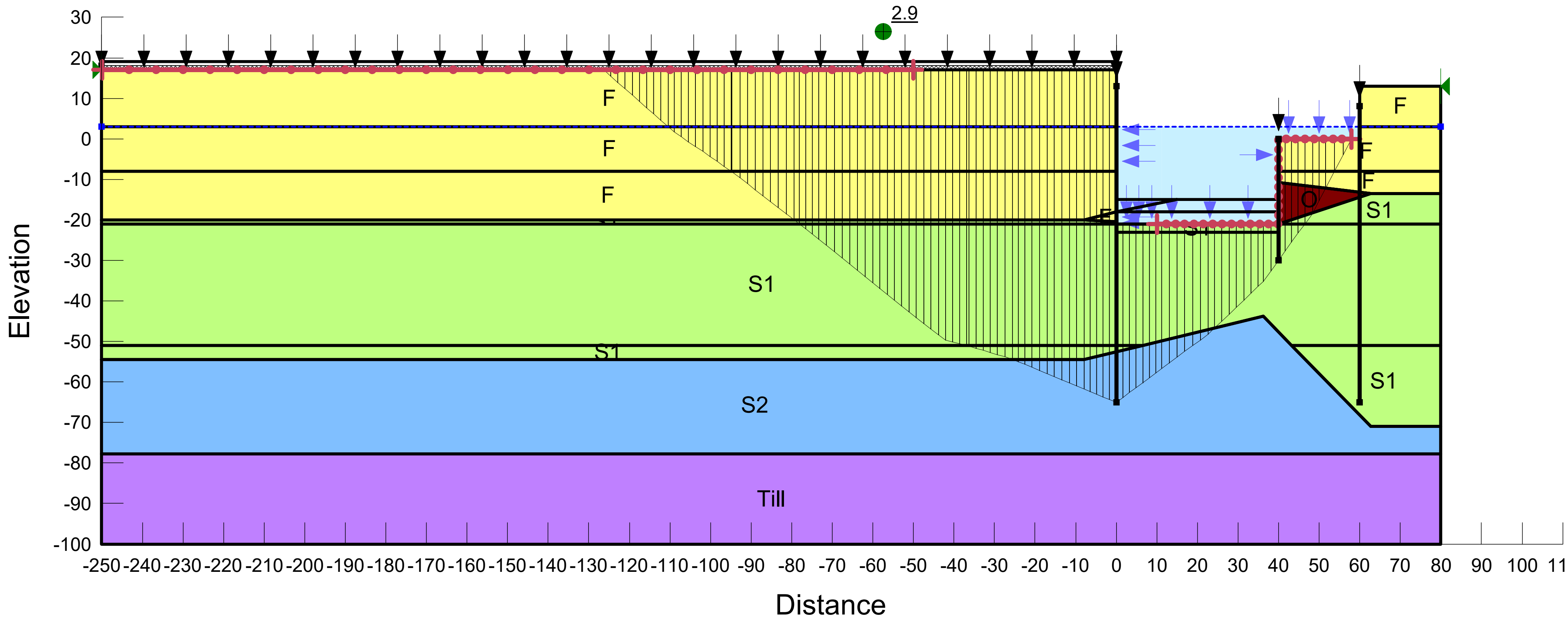
Section B-B Case 3: North-South Seismic

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: F-liq Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 80 psf C-Rate of Change: 1.82 psf/ft Limiting C: 100 psf
Name: S1liq Model: S=f(depth) Unit Weight: 120 pcf C-Top of Layer: 190 psf C-Rate of Change: 2.83 psf/ft Limiting C: 275 psf
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



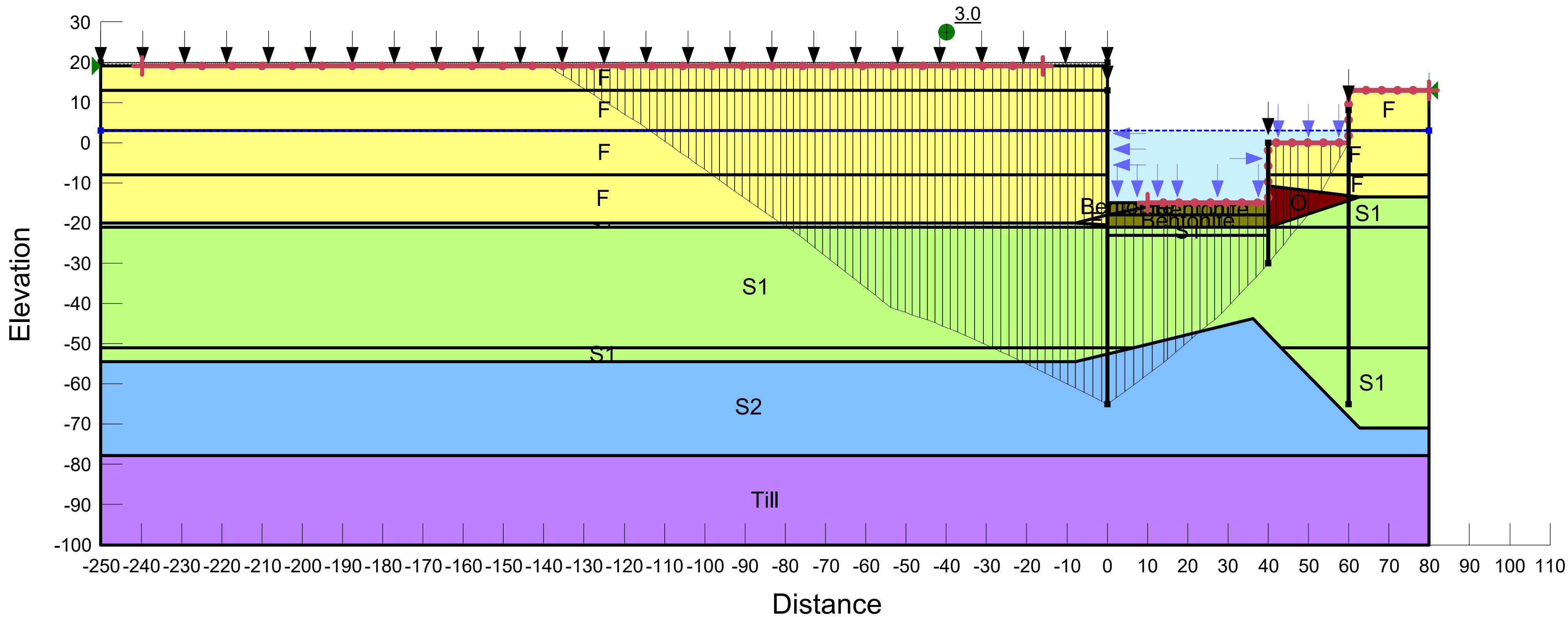
Section B-B Case 1: South-North Temporary Construction

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



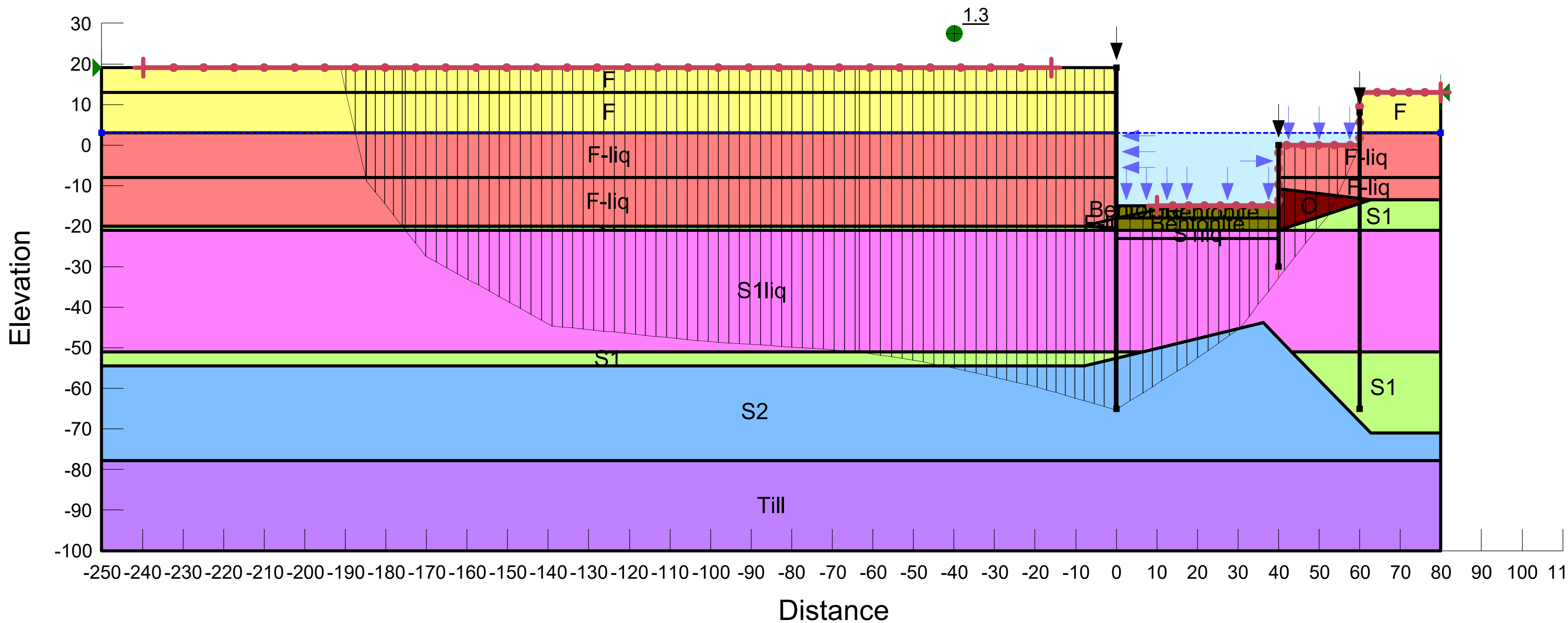
Section B-B Case 2: South-North Service

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



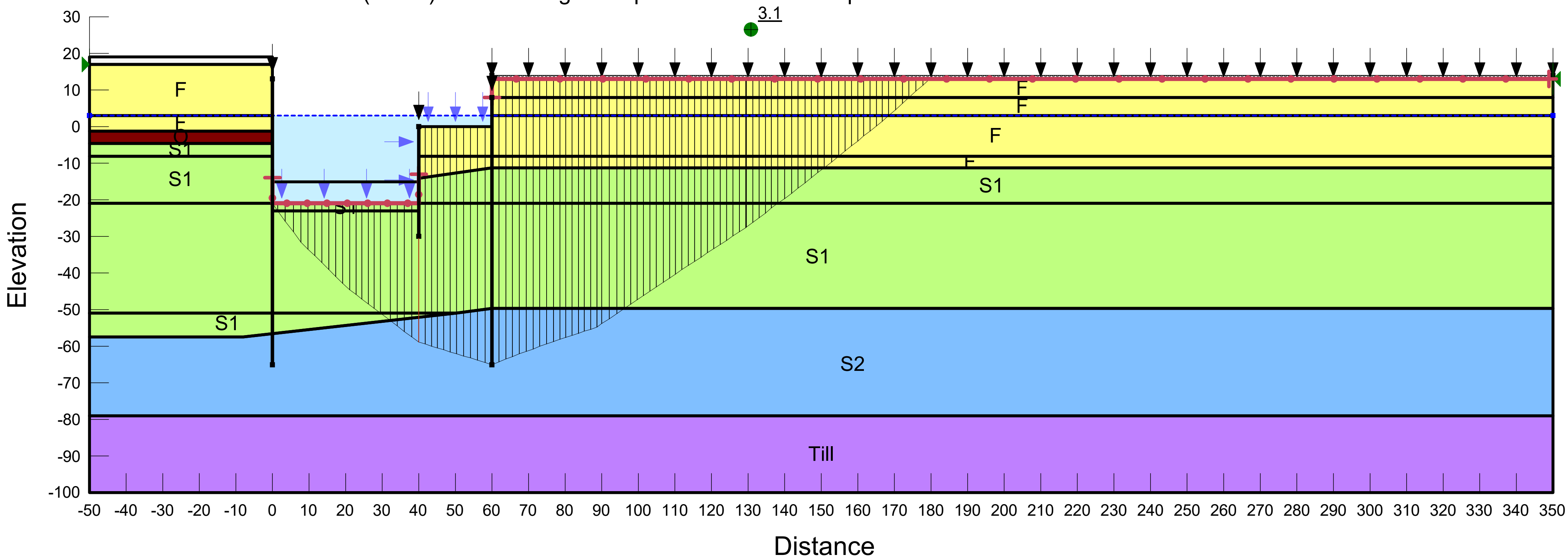
Section B-B Case 3: South-North Seismic

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: F-liq Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 80 psf C-Rate of Change: 1.82 psf/ft Limiting C: 100 psf
Name: S1liq Model: S=f(depth) Unit Weight: 120 pcf C-Top of Layer: 190 psf C-Rate of Change: 2.83 psf/ft Limiting C: 275 psf
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



Section C-C Case 1: North-South Temporary Construction

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



Section C-C Case 2: North-South Service

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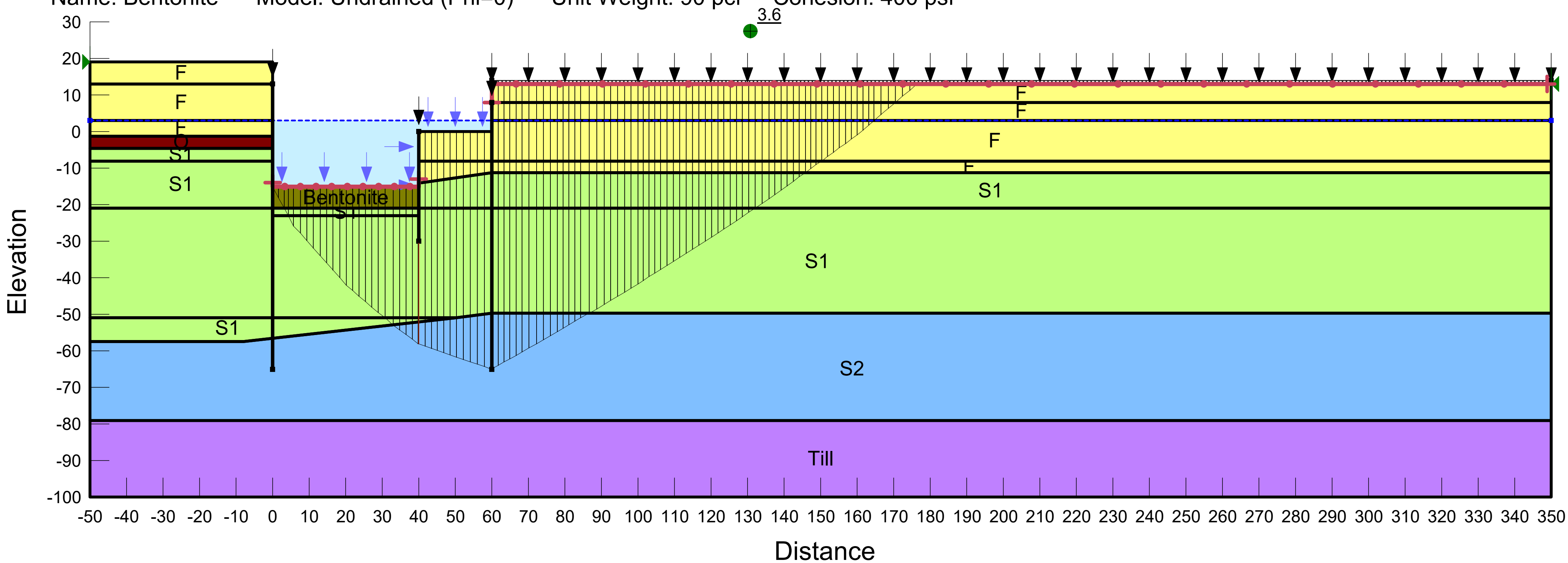
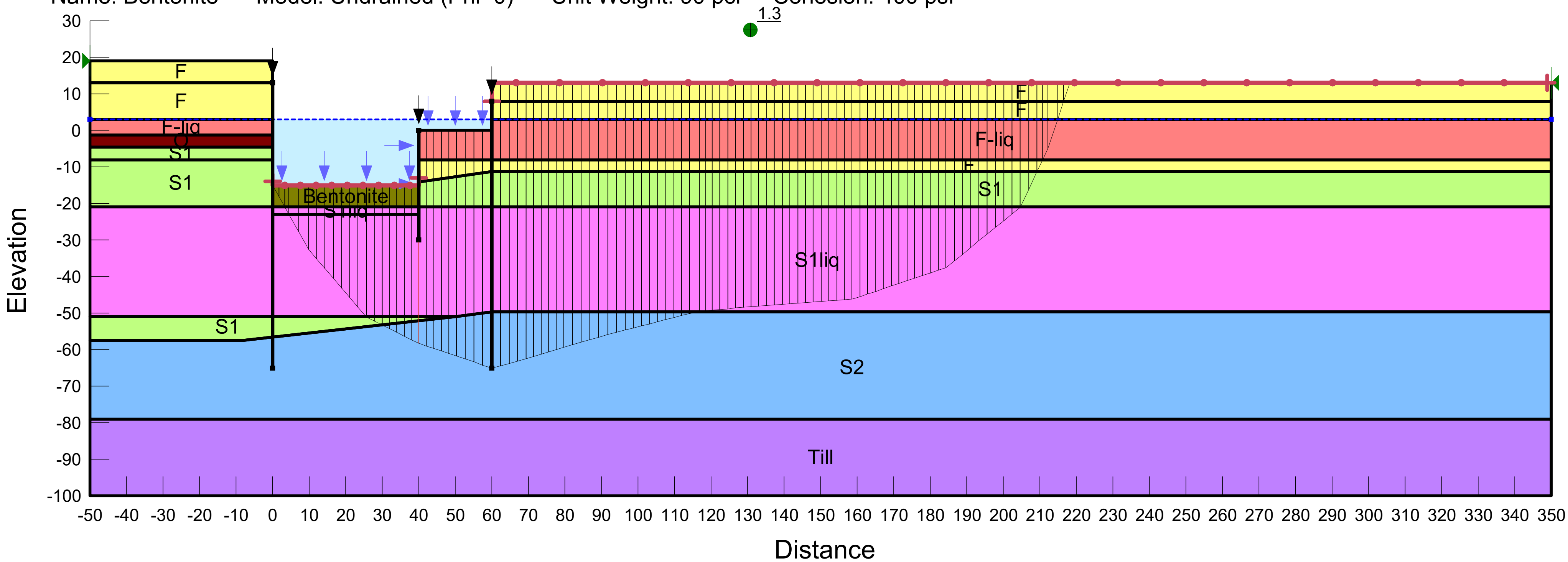
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



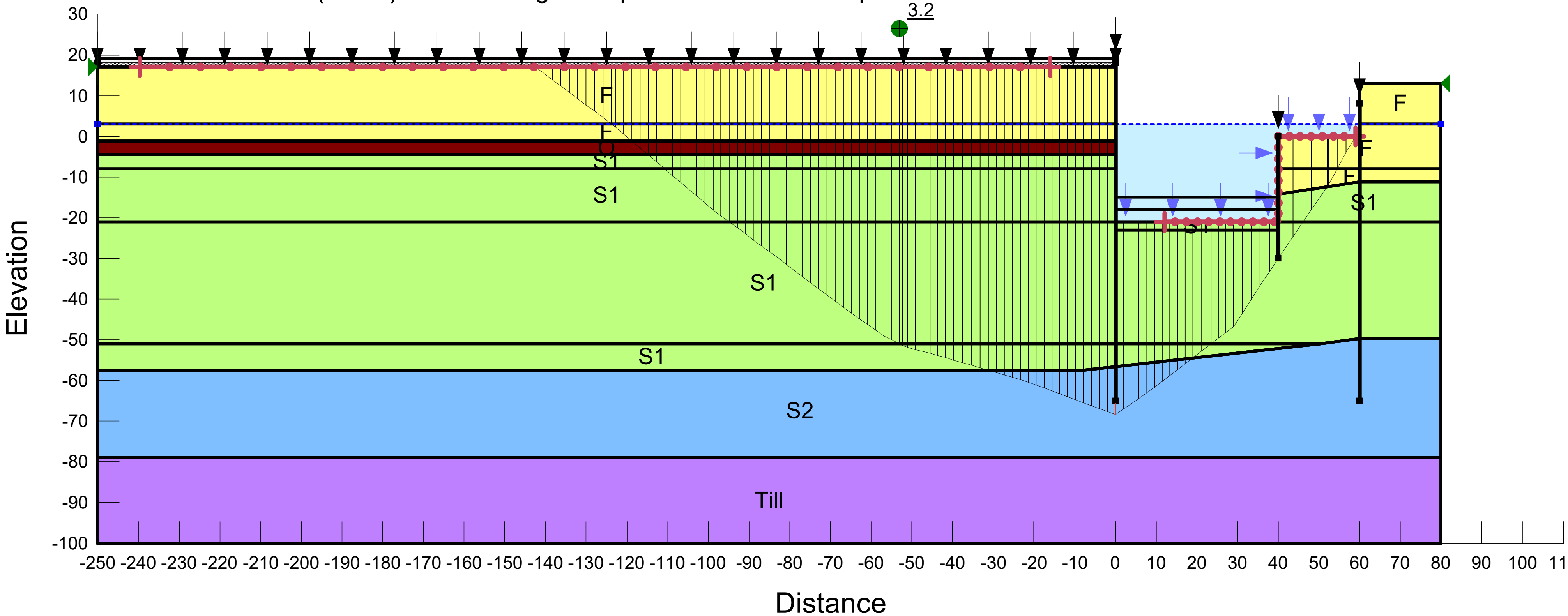
Section C-C Case 3: North-South Seismic

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: F-liq Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 80 psf C-Rate of Change: 1.82 psf/ft Limiting C: 100 psf
Name: S1liq Model: S=f(depth) Unit Weight: 120 pcf C-Top of Layer: 190 psf C-Rate of Change: 2.83 psf/ft Limiting C: 275 psf
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



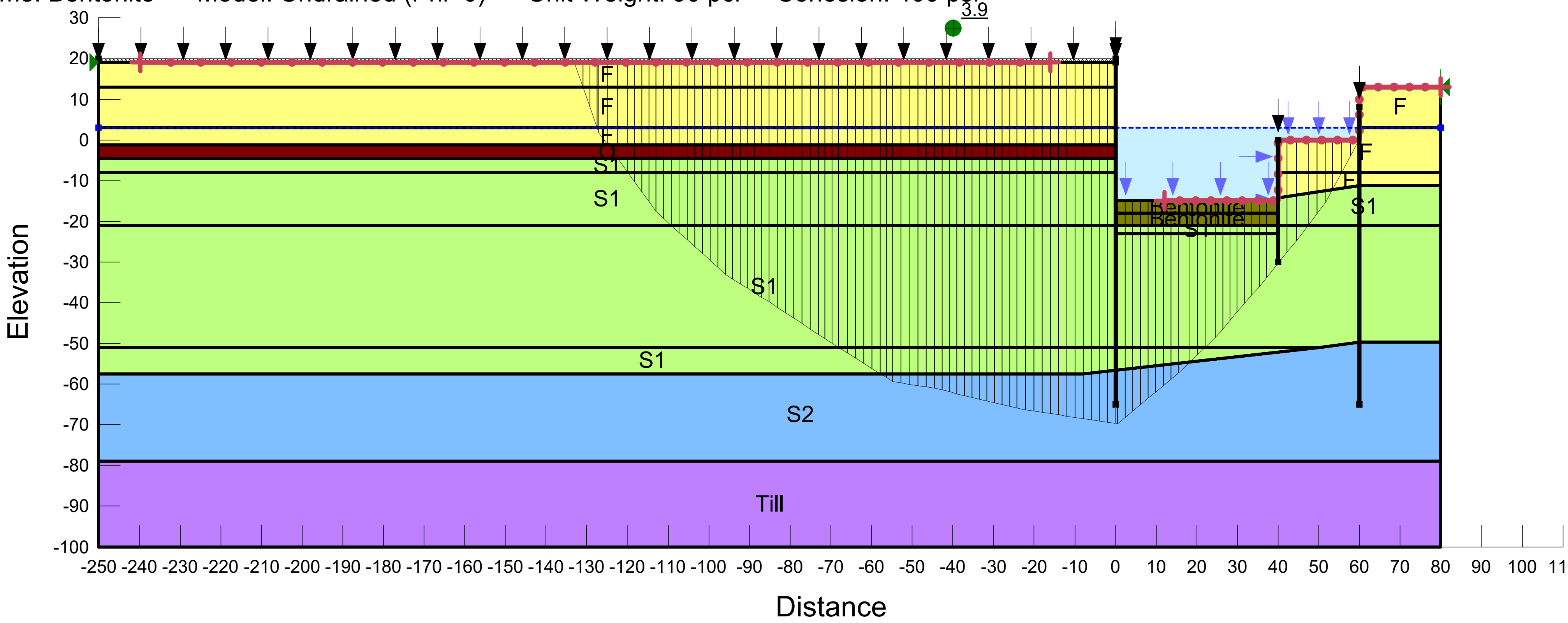
Section C-C Case 1: South-North Temporary Construction

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



Section C-C Case 2: South-North Service

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf



Section C-C Case 3: South-North Seismic

Name: F Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: S1 Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: F-liq Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 80 psf C-Rate of Change: 1.82 psf/ft Limiting C: 100 psf
Name: S1liq Model: S=f(depth) Unit Weight: 120 pcf C-Top of Layer: 190 psf C-Rate of Change: 2.83 psf/ft Limiting C: 275 psf
Name: S2 Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: Till Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 0 psf Phi: 36 °
Name: O Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf
Name: Bentonite Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 400 psf